This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

FORD STOR
nd surgical
8

MEDICAL (

Dr. Ge

LANE
MEDICAL LIBRARY
SEAL OF THE LELAND STANFORD JUNIOR UNIVERSITY
1885

Gift of
Dr. George B. Somers.

DISEASES OF WOMEN

DISEASES OF WOMEN

MEDICAL AND SURGICAL GYNECOLOGY

Geo. D. Souee

BY

CHARLES A. L. REED, A.M., F.C.S., M.D.

FELLOW OF THE COLLEGE OF SURGEONS OF AMERICA; PROFESSOR IN THE UNIVERSITY OF CINCINNATI;
GYNECOLOGIC SURGEON TO THE CINCINNATI HOSPITAL, THE GERMAN DEACONESS' HOSPITAL, AND
THE JEWISH HOSPITAL; FORMER PRESIDENT OF THE AMERICAN MEDICAL ASSOCIATION;
AUTHOR, "TEXT BOOK OF GYNECOLOGY," "MARRIAGE AND GENETICS," ETC.

WITH FOUR HUNDRED AND FORTY-EIGHT
ILLUSTRATIONS IN THE TEXT

NEW YORK AND LONDON
D. APPLETON AND COMPANY
1918

Copyright, 1913, by
D. APPLETON AND COMPANY

Printed in the United States of America

N 201
R323
1913

TO

LEWIS SAMUEL McMURTRY, M.D., LL.D.

PROFESSOR OF GYNECOLOGY AT LOUISVILLE

THIS VOLUME IS DEDICATED

AS A TOKEN OF LONG-STANDING FRIENDSHIP

BY

THE AUTHOR

30072

PREFACE

This book has been written exclusively to meet the demands of utility. My conception of these demands has arisen from a considerable experience as a practitioner, a teacher and an author—I trust always as a student.

The practitioner, whether general or restricted, demands, first, a knowledge of the various pathologic conditions peculiar to women; next the ability to determine what is the matter with the particular case in hand, and, finally, the knowledge what to do for it. The teacher in this department requires, as a reference book for himself and as a text-book for his students, a work that is at once systematic, direct, and brief without being synoptical, and that is comprehensive without being discursive. The writer on gynecology, whether devoting himself to the preparation of a case report, a thesis, or a book, needs a convenient text covering the present status of the particular subject in hand. An effort has been made to meet all of these requirements in the present volume.

In making this effort, recognition has been given to the fact that the topics usually embraced under the title of gynecology have become evolved into a definitely specialized subject. It is an advanced subject in the logical sequence of subjects as they occur in the natural order of medical topics. It is, therefore, a subject the study of which presupposes a knowledge of certain preliminary subjects by the reader. I have consequently omitted elementary anatomy and the more elementary phases of both pathology and bacteriology, all of which have come to be treated more satisfactorily in special works. I have, likewise, omitted the usual bibliographic tables which, I am forced to believe, are all too frequently compiled from the *Index Medicus,* where at least they can be found in more satisfactory form by all persons engaged in literary research. The space usually taken up by the bibliographic tables is here given over to what I believe to be more utilitarian features of the book.

In addition to the topics usually considered under the head of gynecology, *i. e.*, the genitourinary diseases of women, the subject, as it has finally become evolved in practice, embraces surgery of the rectum, certain obstetric operations, and surgical conditions of the kidney and ureters. These subjects in their practical phases have, therefore, been considered with considerable detail in the ensuing pages.

In further fulfillment of my desire to prepare a useful book, I may say:

First: No effort has been made to write a monograph in which the author has tried to give the impress of his individuality to every topic considered, and in which he has endeavored to establish his claim to originality in every procedure described. On the contrary, the effort has been made to give the actual status of each subject as it existed in gynecological science at the moment of writing. Of course, in carrying out this purpose, I have been compelled to exercise what I hope has been a wise eclecticism in the choice of subjects; for to have recapitulated all that has been even well said and well done would have been to write an encyclopedia instead of the volume that is here presented.

Second: In further development of the utilitarian features of the book, I have given emphasis to diagnostic measures as they exist to-day. The first and one of the most important functions that the practitioner can exercise is to determine what is the matter with his case. A considerable experience as consultant has forced upon me the conviction that careful training in diagnostic method is seriously needed and that a book that goes carefully into the question of diagnosis of diseases of women must commend itself to the recognized necessities of the medical profession.

Third: Many cases belonging to the category embraced in this work can be successfully treated, especially in their initial stages, by medical and hygienic measures. I have, therefore, made this feature of therapy conspicuous in the ensuing pages. In doing so, however, I have endeavored to draw a sharp line between what may be classified as medical and surgical conditions. There is no more tragic feature of medical practice to-day than is to be found in the deaths caused by a persistent and fatuous reliance upon medical treatment of conditions that, to the intelligent mind, are obviously amenable only to surgical measures. This kind of practice often amounts to criminal negligence, the responsibility for which, more than ever before, is being defined in the courts of law.

This work, in a definite way, indicates the present limitations of this responsibility.

Fourth: In recognition of the fact that gynecology is a department of general surgery, I have taken pains to give the details of practically all of the recognized operations—in all something over two hundred procedures embraced in this department of practice. In this feature of the work *I have tried as nearly as possible to place the knife in the hands of the reader and then to tell him how to use it by directing him through each succeeding step of the procedure.*

I feel that the last named feature—the fourth—has been so successful that it comprises a possible danger. If the details given shall embolden one not properly drilled and apprenticed in surgical technique to undertake difficult and unfamiliar operations, the book will be an injury rather than a benefit to the public, the conservation of whose interest must always be the master motive of the medical profession. Let it be understood, therefore, that a practical knowledge of gynecology, now merged into abdominal surgery, cannot be gained from any book or books, however well written or accurately illustrated. The acquisition of such knowledge can result only from actual observation, and actual apprenticeship under competent direction. The number of human lives that have been and are now being sacrificed at the hands of merely book-made amateurs in all departments of surgery emphasizes the importance of furnishing the public with some criterion by which they may know who are and who are not surgeons among the licentiates of the different states. It is in this relation, too, that legal responsibility is being rapidly defined through the insistence of the people upon their rights and through a more enlightened discrimination on the part of the courts.

Fifth: The illustrations have been made strictly in conformity with the utilitarian purposes of the book. They have not been employed at all when it has seemed possible to convey an idea with adequate precision by means of the text. In certain instances, however, ideas and especially descriptions thus expressed have been amplified or made more precise by necessary drawings. An effort has been made to get away from the mere picture book idea of conventional illustrations. In carrying out this plan, the artist, Mr. Victor Seydel, has been especially successful in grasping the details which I desired to have thus amplified.

Many of his sketches have been made in the operating room. Others have been made from freehand drawings by myself, while still others have been made from his own individual comprehension of the text. I am thus deeply indebted to Mr. Seydel, not only for his faithful professional work, but for many valuable suggestions, as well as for his pleasant companionship during the more active part of my literary labors in this connection.

In the preparation of this text I have utilized a certain small percentage of material contributed by able writers to a previous work. In every instance in which I have availed myself of these contributions I have done so because they were strictly up to date and because I was unable to improve upon their form. In each instance I have endeavored to give due credit in the text.

The section on "Menstruation" by Dr. Dan Millikin is the only one that has been retained in its entirety. I offer no apology for the inclusion of this contribution, which, both in felicity of expression and scientific accuracy of statement, stands in my mind as the classic of the English language on this subject.

In the preparation of the manuscript, I have been very largely assisted by Mrs. L. E. Shumard, to whose painstaking supervision I am deeply indebted, and to whom I beg to express my appreciation.

I wish to acknowledge my indebtedness to Miss Marion B. Crowell for having seen the work through press, for her careful supervision of the typography, and for her equally skillful preparation of the index.

To my publishers, Messrs. D. Appleton & Company, I wish to express my appreciation of the careful coöperation which has characterized their attitude not only in connection with the present book, but during the twenty years of what has always been to me a pleasant relationship.

CINCINNATI.

CHARLES A. L. REED.

CONTENTS

SECTION I

MALFORMATIONS

CHAPTER PAGE

I. MALFORMATIONS OF THE VULVA 1
- Anatomical Considerations 1
- Absence and Atresia of the Vulva 2
- Fusions of the Clitoris 2
- Double Vulva 3
- Infantile Vulva 3
- Pseudo-hermaphroditism 4

II. MALFORMATIONS OF THE VAGINA 6
- The Hymen 6
- Atypical Hymen 6
- Imperforate Hymen 7
- Absence of the Vagina 8
- Double Vagina 14
- Stenosis of the Vagina 16
- Atresia of the Vagina 17

III. MALFORMATIONS OF THE UTERUS 20
- Anatomical Considerations 20
- Absence and Rudimentary Development of the Uterus . . 22
- The Infantile Uterus 23
- Septate Uterus 24
- Double Uterus 24
- One-horned Uterus 25
- Two-horned Uterus 25

IV. MALFORMATIONS OF THE FALLOPIAN TUBES 27
- Absence and Defective Formation of the Fallopian Tubes . 27
- Supernumerary Fallopian Tubes and Ostia 28
- Congenital Misplacement of the Fallopian Tubes . . 30

V. MALFORMATIONS AND MISPLACEMENTS OF THE OVARIES . . 33
- Congenital Misplacements of the Ovaries 33
- Absence of the Ovaries 34
- Rudimentary Ovaries 34

VI. MALFORMATIONS OF THE URETHRA 37
- Absence of the Urethra 37
- Hypospadias 37
- Epispadias 38

CHAPTER PAGE
VII. MALFORMATIONS OF THE BLADDER 40
Extroversion of the Bladder 40
Patulous Urachus 44
VIII. MALFORMATIONS OF THE URETERS 46
Duplication of the Ureters 46
Stricture of the Ureter 46
IX. MALFORMATIONS OF THE KIDNEY 48
Anomalies of Number 48
Anomalies of Location 49
Anomalies of Form 49
X. MALFORMATIONS OF THE RECTUM 51
Absence, Atresia, and Stenosis of the Anus 51
Vulvar Anus 53
Anomalous Anus 55
XI. MALFORMATIONS OF THE BREAST 56
Absence and Rudimentary Development of the Mammary Glands 56
Supernumerary Breasts 56

SECTION II

INJURIES

I. INJURIES OF THE VULVA 58
Lacerations of the Vulva 58
Injuries due to Rape 58
Indecent Assault 62
Pudendal Hematocele 62
II. LACERATIONS OF THE PERINEUM 64
Operations for Incomplete Lacerations 74
Secondary Operations for the Repair of Complete Tears of the Perineum 88
After-treatment of Perineal Operations 99
III. INJURIES OF THE VAGINA 101
Rupture of the Vagina 101
Vaginal Fistulæ 101
Vesicovaginal Fistulæ 102
Ureterovaginal Fistulæ 113
Rectovaginal Fistulæ 114
Enterovaginal Fistulæ 118
Urethrovaginal Fistulæ 120
IV. INJURIES OF THE UTERUS 122
Lacerations of the Cervix Uteri 122
Vesicocervical Fistula 129
Penetrating Wounds of the Uterus 133
Rupture of the Uterus during Parturition 135

CHAPTER PAGE
V. INJURIES OF THE FALLOPIAN TUBES 136
Sterilization of Women 136
VI. INJURIES OF THE OVARIES 139
VII. INJURIES OF THE URETHRA 140
VIII. INJURIES OF THE BLADDER 144
IX. INJURIES OF THE URETER 148
X. INJURIES OF THE KIDNEYS 158
Contusions of the Kidneys 158
Rupture of the Kidney 159
XI. INJURIES OF THE RECTUM 168

SECTION III

DISPLACEMENTS

I. DISPLACEMENTS OF THE VAGINA 171
Urethrocele 171
Cystocele 173
II. DISPLACEMENTS OF THE UTERUS 188
Normal Position of the Uterus 188
Causes of Uterine Displacements 191
Pathology of Uterine Displacements 194
Symptoms and Diagnosis of Uterine Displacements . . 200
Treatment of Displacements of the Uterus . . . 203
Topical and Manipulative Treatment of Retrodisplacements of the Uterus 204
Posture, Massage, and Tamponade in the Treatment of Retrodeviations of the Uterus 208
Instrumental Treatment of Retrodisplacements of the Uterus 210
Surgical Treatment of Retrodisplacements of the Uterus in General 213
Suspension Procedures for Restoration of the Retrodisplaced Uterus 213
Operations for Shortening the Uterine Ligaments . . 215
Treatment of Conditions Associated with Retrodisplacement of the Uterus 229
Treatment of Anterior Displacements of the Uterus . 232
Treatment of Prolapsus of the Uterus 236
Treatment of the Lateral Displacements of the Uterus . 243
Treatment of Inversion of the Uterus 243
III. DISPLACEMENTS OF THE FALLOPIAN TUBES 244
IV. DISPLACEMENTS OF THE OVARIES 246
V. DISPLACEMENTS OF THE KIDNEY 250

CHAPTER PAGE
VI. Displacements of the Rectum 264
Displacements of the Posterior Wall of the Rectum or Posterior Rectocele 264
Prolapsus of the Rectum 266
VII. Displacements of the Intestines 267
Vaginal Enterocele 267

SECTION IV

FOREIGN BODIES, INCLUDING CALCULI

I. Foreign Bodies in the Vagina 271
II. Foreign Bodies in the Uterus 273
III. Foreign Bodies in the Urethra 275
IV. Foreign Bodies in the Bladder 276
V. Foreign Bodies in the Ureter (Ureteral Calculi) . . 279
VI. Foreign Bodies in the Kidneys 285
VII. Foreign Bodies (Calculi) in the Urachus 289
VIII. Foreign Bodies in the Rectum 290

SECTION V

INFECTIONS OF THE GENITOURINARY TRACT IN WOMEN

I. Introduction 291
Normal Bacteriology of the Female Genitourinary Organs . 291
Pathogenic Infection of the Female Genital Organs . . 294
II. Gonococcus Infection of the Genitourinary Tract in Women 297
Gonococcus Infection of the Vulva and Vagina . . . 299
Gonococcus Infection of the Vulvovaginal Gland (Bartholinitis) 299
Gonococcus Infection of the Uterus 302
Gonococcus Infection of the Fallopian Tubes . . . 304
  Hydrosalpinx 308
  Hematosalpinx 311
  Pyosalpinx 312
Gonococcus Infection of the Ovaries 315
Gonococcus Infection of the Urethra and Bladder . . 317
Gonococcus Infection of the Kidney 319
Gonococcus Infection of the Rectum 319
Symptoms and Diagnosis of Gonococcus Infection . . 320
  Latent Form 329
Prognosis of Gonococcus Infection 331
Treatment of Gonococcus Infection 331
  Puncture and Drainage 334
  Extirpation of Uterine Appendages 342

CHAPTER PAGE
II. GONOCOCCUS INFECTION OF THE GENITOURINARY TRACT IN WOMEN (*Continued*)
Treatment of Gonococcus Infection of the Urethra and Bladder 349
Treatment of Gonococcus Infection of the Kidney . 350
III. SPIROCHÆTA PALLIDA INFECTION (SYPHILIS) 352
Spirochæta Pallida Infection of the Vulva 352
Spirochæta Pallida Infection of the Vagina 354
Spirochæta Pallida Infection of the Uterus 354
Spirochæta Pallida Infection of the Fallopian Tubes . . 355
Spirochæta Pallida Infection of the Ovaries 355
Spirochæta Pallida Infection of the Pelvic Lymphatics . 355
Spirochæta Pallida Infection of the Nipples 355
Spirochæta Pallida Infection of the Bladder 355
Pathology of Spirochæta Pallida Infection 355
Symptoms and Diagnosis of Spirochæta Pallida Infection 356
Treatment of Spirochæta Pallida Infection 358
Spirochæta Pallida Infection of the Breast 360
IV. BACILLUS DUCREY INFECTION (CHANCROID) OF THE GENITOURINARY TRACT IN WOMEN 361
Diagnosis 362
Prognosis 363
Treatment 363
V. STREPTOCOCCUS INFECTION OF THE GENITOURINARY TRACT IN WOMEN 365
Pathology of Streptococcus Infection 365
Streptococcus Infection of the External Genital Organs (Erysipelas of the Vulva and Vagina) 366
Streptococcus Infection of the Uterus (Puerperal Infection) 367
Streptococcus Infection of the Pelvic Peritoneum . . 372
Streptococcus Infection of the Fallopian Tubes . . 373
Streptococcus Infection of the Ovaries 375
Symptoms and Diagnosis of Streptococcus Infection . . 376
Streptococcus Infection of the Vulva and Vagina . . 376
Streptococcus Infection of the Uterus 376
Streptococcus Infection of the Fallopian Tubes . . 377
Streptococcus Infection of the Ovaries 379
Treatment of Streptococcus Infection 380
Streptococcus Infection of the Vulva and Vagina (Erysipelas of the Vulva and Vagina) 380
Streptococcus Infection of the Uterus (Puerperal Infection) 381
Streptococcus Infection of the Fallopian Tubes . . 384
Streptococcus Infection of the Ovaries 384

CHAPTER PAGE
VI. TUBERCULOUS INFECTION OF THE GENITOURINARY TRACT IN WOMEN . . . 386
Pathology of Tuberculous Infection . . . 386
Tuberculosis of the Vulva . . . 387
Tuberculous Infection of the Vagina . . . 389
Tuberculous Infection of the Uterus . . . 390
Tuberculous Infection of the Cervix Uteri . . . 390
Tuberculous Infection of the Cavity and Body of the Uterus (Corporeal Tuberculosis, Tuberculous Endometritis, Tuberculous Parametritis) . . . 392
Tuberculous Infection of the Fallopian Tubes . . . 394
Tuberculous Infection of the Ovary . . . 399
Tuberculous Infection of the Pelvic Peritoneum . . . 402
Tuberculous Infection of the Bladder . . . 404
Tuberculous Infection of the Kidney . . . 405
Tuberculous Infection of the Rectum . . . 407
Tuberculous Infection of the Breast (Tuberculous Mastitis) . . . 408
Symptoms and Diagnosis of Tuberculous Infection . . . 408
Tuberculous Infection of the Vulva . . . 408
Tuberculosis of the Cervix Uteri . . . 409
Tuberculous Infection of the Vagina . . . 410
Tuberculous Infection of the Body of the Uterus . . . 411
Tuberculous Infection of the Fallopian Tubes . . . 412
Tuberculous Infection of the Ovaries . . . 413
Tuberculous Infection of the Pelvic Peritoneum . . . 414
Tuberculous Infection of the Bladder . . . 417
Tuberculous Infection of the Kidney . . . 418
Tuberculous Infection of the Rectum . . . 419
Tuberculous Infection of the Breast . . . 420
Treatment of Tuberculous Infection . . . 420
General Management of Tuberculous Infection . . . 420
Tuberculous Infection of the Vulva and Vagina . . . 423
Tuberculous Infection of the Uterus . . . 424
Tuberculous Infection of the Fallopian Tubes . . . 425
Tuberculous Infection of the Ovaries . . . 426
Tuberculous Infection of the Pelvic Peritoneum . . . 427
Tuberculous Infection of the Urethra . . . 428
Tuberculous Infection of the Bladder . . . 428
Tuberculous Infection of the Kidney . . . 430
Tuberculous Infection of the Rectum . . . 430
Tuberculous Infection of the Breast . . . 431
VII. BACILLUS DIPHTHERITICUS INFECTION OF THE FEMALE GENITOURINARY ORGANS . . . 433
VIII. OIDIUM-ALBICANS INFECTION OF THE FEMALE GENITOURINARY ORGANS . . . 434

CHAPTER PAGE
IX. BACILLUS-COLI INFECTION OF THE FEMALE GENITOURINARY ORGANS 435
X. PNEUMOCOCCUS INFECTION OF THE FEMALE GENITOURINARY ORGANS 438
XI. STAPHYLOCOCCUS INFECTION OF THE FEMALE GENITOURINARY ORGANS 440
XII. SAPROPHYTIC INFECTION OF THE FEMALE GENITOURINARY ORGANS 441
XIII. SEPTIC VIBRION INFECTION OF THE FEMALE GENITOURINARY ORGANS 442
XIV. MIXED INFECTIONS OF THE FEMALE GENITOURINARY ORGANS . 443
Bacteriology of Mixed Infections 443
Mixed Infection of the Vulva (Vulvitis) 446
Intertrigo of the Vulva 446
Erythema of the Vulva 449
Eczema of the Vulva 450
Folliculitis of the Vulva 452
Herpes Progenitalis of the Vulva 454
Bartholinitis 457
Mixed Infection of the Vagina (Vaginitis) 457
Mixed Infection of the Uterus (Endometritis and Metritis) 459
Mixed Infection of the Fallopian Tubes (Salpingitis) . . 470
Mixed Infection of the Ovaries (Ovaritis) 470
Mixed Infection of the Bladder (Cystitis) 471
Mixed Infection of the Kidney (Nephritis) 474
Mixed Infection of the Breast (Mastitis) 481
XV. PARASITIC INFECTIONS OF THE FEMALE GENERATIVE ORGANS . 484
Trichophyton-Tonsurans Infection 484
Phthirius-Inguinalis Infection 485
Distoma-Hematobium Infection 486
Filaria Sanguinis Hominis Infection 486
Echinococcus Infection 487
Actinomycosis Infection 490

SECTION VI

NEOPLASMS

I. MYOMATA OF FEMALE GENITOURINARY ORGANS 491
Pathology of Myomata 491
Myomata of the Vulva 491
Myomata of the Vagina 492
Myomata of the Uterus 493
Myomata of the Ovaries 499
Myomata of the Intestinal Wall 499
Myomata of the Kidney 499
Myomata of the Rectum and Intestine 500
Myomata of the Broad Ligament 500

CHAPTER PAGE
I. MYOMATA OF FEMALE GENITOURINARY ORGANS (*Continued*)
  Symptoms and Diagnosis of Myomata 501
    Myomata of the Vulva 501
    Myomata of the Vagina 501
    Uterine Myomata 502
    Myomata of the Broad Ligament 504
    Myomata of the Kidneys 504
  Treatment of Myomata 504
    Myomata of the Vulva 504
    Myomata of the Vagina 505
    Uterine Myomata 505
    Myomata of the Kidneys 532
    Myomata of the Broad Ligament 533
II. CHORIOEPITHELIOMATA OF THE UTERUS (SYNCYTIOMA MALIGNUM) 535
III. CARCINOMATA OF THE FEMALE GENITOURINARY ORGANS . . 539
  Pathology of Carcinomata 539
    Carcinomata of the Vulva 539
    Carcinomata of the Vagina 541
    Carcinomata of the Uterus 542
    Carcinomata of the Fallopian Tubes 548
    Carcinomata of the Ovary 548
    Carcinomata of the Urethra 551
    Carcinomata of the Bladder 551
    Carcinomata of the Kidney 553
    Carcinomata of the Rectum 553
    Carcinomata of the Breast 554
  Symptoms and Diagnosis of Carcinomata 555
    Carcinomata of the Vulva 555
    Carcinomata of the Vagina 556
    Carcinomata Uteri 556
    Carcinomata of the Fallopian Tubes 558
    Carcinomata of the Ovary 558
    Carcinomata of the Urethra 558
    Carcinomata of the Kidney 559
    Carcinomata of the Rectum 560
    Carcinomata of the Breast 560
  Treatment of Carcinomata 561
    Carcinomata of the Vulva 561
    Carcinomata of the Vagina 562
    Carcinomata of the Uterus 564
    Carcinomata of the Fallopian Tubes 582
    Carcinomata of the Ovary 582
    Carcinomata of the Urethra 582
    Carcinomata of the Bladder 584
    Carcinomata of the Kidney 591
    Carcinomata of the Rectum 591
    Carcinomata of the Breast 599

CHAPTER PAGE
IV. SARCOMATA 610
  Pathology of Sarcomata 610
    Sarcomata of the Vulva 611
    Sarcomata of the Vagina 612
    Sarcomata of the Uterus 614
    Sarcomata of the Ovary 617
    Sarcomata of the Bladder 620
    Sarcomata of the Kidney 620
  Symptoms and Diagnosis of Sarcomata 621
    Sarcomata of the Vulva 621
    Sarcomata of the Vagina 621
    Sarcomata of the Uterus 621
    Sarcomata of the Ovary 622
    Sarcomata of the Bladder 622
    Sarcomata of the Kidney 622
  Treatment of Sarcomata 623
    Surgical Treatment of Sarcomata 623
    Toxin Treatment for Inoperable Sarcomata in General 624
    Palliative Treatment of Sarcomata 625
V. ADENOMATA OF THE FEMALE GENITOURINARY ORGANS . . 626
  Adenoma of the Vulva 626
  Adenomyomata of the Round Ligament 626
  Adenoma of the Uterus 627
    Adenomyomata of the Uterus 627
    Adenoma Malignum of the Uterus 627
  Adenoma of the Ovary 630
    Cystadenomata of the Ovary (Ovarian Tumors) . . 630
    Ovarian Embryomata (Dermoid Cysts and Teratomata) 638
    Complications of Cystadenomata and Embryomata of the Ovary 640
    Symptoms and Diagnosis of Cystadenomata and Embryomata of the Ovary 645
    Treatment of Cystadenomata and Embryomata of the Ovary 651
  Adenomata of the Breast 662
  Adenomata of the Kidney 664
  Adenomata of the Rectum 664
VI. CYSTOMATA 666
  Cystomata of the Vulva 666
  Cystomata of the Vagina 666
  Cystomata of the Uterus (Cystic Cervix) 669
  Cystomata of the Fallopian Tubes 670
  Cystomata of the Ovaries (Cystic Ovaries) 670
    Cysts of the Graafian Follicle 671
    Cysts of the Corpus Luteum 672
    Tuboövarian Cystomata 673

CHAPTER PAGE

VI. CYSTOMATA (*Continued*)
  Cystomata of the Parovarium 676
  Cystoma (Hydrocele) of the Round Ligament . . . 684
  Cystomata of the Kidney 685
  Cystomata of the Breast 688
  Cystomata of the Rectum 689
VII. ADDITIONAL NEOPLASMS 690
  Neoplasms of Vascular Origin and Varicose Conditions . 690
    Varicose Veins of the Vulva 690
    Pelvic Varicocele and Aneurysmal Varix . . . 691
    Hemorrhoids 694

SECTION VII

TROPHIC CHANGES

I. ATROPHY OF THE VULVA 701
  Progressive Cutaneous Atrophy of the Vulva . . . 702
II. ATROPHY OF THE VAGINA 707
III. ATROPHY OF THE UTERUS 708
  Arteriosclerosis of the Uterus 708

SECTION VIII

SURGICAL CONDITIONS OF PREGNANCY AND PARTURITION

I. EVACUATION OF THE PREGNANT UTERUS 710
II. ECTOPIC PREGNANCY 713
  Symptoms and Diagnosis of Ectopic Pregnancy . . . 718
  Treatment of Ectopic Pregnancy 722
III. RUPTURE OF THE UTERUS 727
  Rupture of the Uterus during Pregnancy 727
  Rupture of the Uterus during Labor 728
IV. SURGICAL INTERVENTION IN DYSTOCIA 733
  Surgical Enlargement of the Bony Outlet in Dystocia . . 734
  Conditions Demanding Intervention by Cesarean Section . 737
    Celiohysterectomy 746
V. INVERSION OF THE UTERUS 749
  Treatment of Inversion of the Uterus 752
    Recent or Acute Cases 752
    Chronic Cases 753

SECTION IX

MENSTRUATION AND ITS DISORDERS

I. NORMAL MENSTRUATION 756
  Rutting and Menstruation 757
  Period of Appearance of Menstruation 759
  The Menstrual Cycle 761

CHAPTER PAGE
I. NORMAL MENSTRUATION (*Continued*)
The Quantity of the Menstrual Discharge 762
Character of the Menstrual Discharge 763
The Inducing Cause of Menstruation 764
The Rôle of the Uterus in Menstruation 766
The Rôle of the Fallopian Tubes in Menstruation . . 767
The Rôle of the Ovaries in Menstruation 768
The Hygienic Management of Normal Menstruation . . 770
II. MENORRHAGIA 772
Causes of Menorrhagia 772
Treatment of Menorrhagia 774
III. METRORRHAGIA 778
IV. AMENORRHEA 780
Retention of Menses 783
V. DYSMENORRHEA 784
Membranous Dysmenorrhea 791
Intermenstrual Pain 793
VI. VICARIOUS MENSTRUATION 795
VII. THE MENOPAUSE 798

APPENDIX A

METHODS OF EXAMINATION AND DIAGNOSIS

History of the Case 805
The Record Form 805
The Physical Examination 806
Posture of the Patient 808
Examination by Inspection 811
Examination by Palpation 812
Examination by Digital Exploration 813
Examination of the Vagina and Uterus by Instruments . . . 816
Examination of the Urethra 823
Examination of the Bladder 823
Examination of the Ureters and Kidneys by Catheterization . . 826
Examination of the Urines by Segregation 827
Examination of the Rectum 830

APPENDIX B

GENERAL PROCEDURE IN ABDOMINAL OPERATIONS

Preparation of the Patient 838
Preparation in Cases of Emergency 839
Preparation in Elective Cases 841
Instruments for General Abdominal Operations 843
The Surgical Pavilion 847

PAGE
Anesthesia and Anesthetics 848
  Ether Anesthesia 848
  Chloroform Anesthesia 849
  Cocain Anesthesia 850
  Nitrous-Oxid-Oxygen Anesthesia 851
  Hedonal 854
The Abdominal Incision 855
  Drainage 866
  Dressing of the Abdominal Wound 867
  After-treatment of Abdominal Section 868
INDEX 873

LIST OF ILLUSTRATIONS

FIGURE PAGE

1.—Goff's case of pseudo-hermaphroditism showing penis-like development of clitoris and vaginal orifice 4

2.—Clitoris removed from Goff's case of pseudo-hermaphroditism . 5

3.—Imperforate hymen with resulting accumulation of menstrual fluid (hematocolpos) causing dilatation and hypertrophy of the vagina and uterus 7

4.—Procedure in congenital absence of vagina (a) 9

5.—Procedure in congenital absence of vagina (b) 9

6.—Procedure in congenital absence of the vagina (c) . . . 10

7.—Fergusson's procedure for congenital absence of the vagina (a) . 10

8.—Fergusson's procedure for congenital absence of the vagina (b) . 10

9.—Fergusson's procedure for congenital absence of the vagina (c) . 11

10.—Fargas procedure for congenital absence of vagina . . . 12

11.—Baldwin's procedure for congenital absence of the vagina (a) . 13

12.—Baldwin's procedure for congenital absence of vagina (b) . . 14

13.—Partial septate vagina with single uterus 15

14.—Complete septate vagina in double vagina with double uterus . 15

15.—Complete septate vagina or double vagina with single uterus . 15

16.—Partial septate vagina with double uterus, one rudimentary vagina being occluded with resulting retention (unilateral hematocolpos) 15

17.—Uterus duplex 20

18.—Uterus unicornis 20

19.—Uterus bicornis 20

20.—An irregularly formed bicornate uterus with each horn well developed 22

21.—Congenital absence of the outer third of right Fallopian tube . 28

22.—Accessory ostium of the Fallopian tube 29

23.—Congenital or early post-natal torsion of the Fallopian tube causing enlargement of the ovary 31

24.—Absence of the posterior wall of the urethra 37

25-27.—Tiersch procedure for extroversion of the bladder . . . 42

28-30.—Maydl procedure for uretero-intestinal implantation in extroversion of the bladder 43

31.—Absence of anus 50

32.—Atresia of anus 51

33.—Stenosis of anus 51

34.—Vulvar anus showing absence of true anus and rectum communicating with vagina 54

35.—Types of hymen 59

FIGURE PAGE
36.—Schematic representation of the pelvic floor, showing the two muscular layers 64
37.—The external muscular layer, the bulbocavernosus, transversus perinei, and the sphincter ani muscle converging to form the "perineal body" or the nidus perinei 65
38.—The deep muscular layer; the ischiococcygeus, the ileococcygeus, the pubococcygeus, and the puborectalis muscles, the two latter constituting the levator ani muscle 66
39.—Transverse section showing normal relations of the urethra, vagina, and rectum at the level of the deep muscular layer . . 66
40.—Rupture of the vagina, the laceration extending through the left levator ani muscle 69
41.—Rupture of the vagina, the laceration extending through the levator ani muscle on both sides 69
42.—Digital diagnosis of relaxed vaginal outlet 69
43.—Complete laceration of the perineum 70
44.—Superficial tear of perineum at time of occurrence . . . 71
45.—Deep tear but not involving sphincter ani muscle, as seen at time of occurrence 71
46.—Complete tear involving all the perineal structures as seen at the time of occurrence 71
47.—Immediate repair of deep but not complete laceration of the perineum 72
48.—Author's procedure of perineorrhaphy for partial laceration (a) 73
49.—Author's procedure of perineorrhaphy for partial laceration (b) 74
50.—Author's procedure of perineorrhaphy for partial laceration (c) 75
51.—Emmet procedure for repair of partial laceration of the perineum (a) 76
52.—Emmet procedure for repair of partial laceration of the perineum (b) 77
53.—Emmet procedure for repair of partial laceration of the perineum (c) 77
54.—Emmet procedure in complete laceration of the perineum . . 78
55.—Andrew's method of suturing the central flap in operation for incomplete tear of the perineum 79
56.—Martin modification of the Emmet procedure (a) . . . 79
57.—Martin modification of the Emmet procedure (b) . . . 80
58.—Dudley modification of the Emmet procedure (a) . . . 80
59.—Dudley modification of the Emmet procedure (b) . . . 80
60.—Simon-Hegar modification of the Emmet procedure (a) . . 81
61.—Simon-Hegar modification of the Emmet procedure (b) . . 81
62.—Simon-Hegar modification of the Emmet procedure (c) . . 82
63.—Procedure for repair of incomplete tear of the perineum by the flap-splitting method (a) 83
64.—Procedure for repair of incomplete tear of the perineum by the flap-splitting method (b) 84

FIGURE PAGE
65.—Procedure for repair of incomplete tear of the perineum by the flap-splitting method (c) 85
66.—Procedure for repair of incomplete tear of the perineum by the flap-splitting method (d) 85
67-69.—Tait procedure for repair of incomplete tear of the perineum by the flap-splitting method 86
70-72.—Duke modification of the Tait flap-splitting procedure for repair of incomplete tear of the perineum 87
73.—Martin procedure for repair of complete laceration of the perineum (a) 90
74.—Martin procedure for repair of complete laceration of the perineum (b) 91
75.—Martin procedure for repair of complete laceration of the perineum (c) 91
76-77.—Lauenstein procedure for repair of complete laceration of the perineum 92
78-79.—Kelly procedure for repair of incomplete tear of the perineum 93
80.—Author's procedure for repair of complete laceration of the perineum by the flap-splitting method (a) 94
81.—Author's procedure for repair of complete laceration of the perineum by the flap-splitting method (b) 94
82.—Author's procedure for repair of complete laceration of the perineum by the flap-splitting method (c) 95
83.—Author's procedure for repair of complete laceration of the perineum by the flap-splitting method (d) 95
84.—Author's procedure for repair of complete laceration of the perineum by the flap-splitting method (e) 96
85.—Tait procedure for repair of complete laceration of the perineum by the flap-splitting method (a) 97
86.—Tait procedure for repair of complete laceration of the perineum by the flap-splitting method (b) 97
87.—Tait procedure for repair of complete laceration of the perineum by the flap-splitting method (c) 98
88.—Tait procedure for repair of complete laceration of the perineum by the flap-splitting method (d) 98
89.—Ristine procedure for repair of complete laceration of the perineum 99
90.—Vesicovaginal fistula 102
91.—Vesicocervico-vaginal fistulæ 103
92-94.—Sims procedure for repair of vesicovaginal fistula 106
95.—Author's procedure for repair of vesicovaginal fistula by the flap-splitting method (a) 108
96.—Author's procedure for repair of vesicovaginal fistula by the flap-splitting method (b) 109
97.—Author's procedure for repair of vesicovaginal fistula by the flap-splitting method (c) 109

FIGURE PAGE
98.—Constricted surfaces of approximation by the old through and through methods of suture in procedure for repair of vesicovaginal fistula by the flap-splitting method 110
99.—Author's procedure B for repair of vesicovaginal fistulæ by the flap-sliding method (a) 111
100.—Author's procedure B for repair of vesicovaginal fistulæ by the flap-sliding method (b) 111
101.—Author's procedure B for repair of vesicovaginal fistulæ by the flap-sliding method (c) 111
102.—Author's procedure B for repair of vesicovaginal fistulæ by the flap-sliding method (d) 111
103.—Fargas procedure for occlusion of vesicovaginal fistula by vesicocervical anastomosis 112
104 and 105.—Form of tips of self-retaining soft rubber catheters . 113
106.—Rectovaginal fistula 115
107-109.—Mayo-Robson procedure for repair of rectovaginal fistula . 117
110.—Enterovaginal fistula 119
111.—Procedure for closure of urethrovaginal fistula (a) . . . 120
112.—Procedure for closure of urethrovaginal fistula (b) . . . 121
113.—Procedure for closure of urethrovaginal fistula (c) . . . 121
114.—Laceration of the cervix, both sides, with eversion of both lips (ectropion) and hypertrophy of the follicles . . . 122
115.—Laceration of the cervix, one side, with eversion of one lip of the cervix and hypertrophy of the glands 123
116-117.—Emmet procedure for repair of laceration of the cervix . . 126
118.—Knife devised by Newman 127
119-121.—Auvard procedure for repair of lacerated cervix . . . 128
122 and 123.—Schroeder procedure for repair of lacerated cervix . . 128
124.—Fournier procedure for repair of lacerated cervix . . . 129
125.—Vesicouterine fistula 130
126.—Vesicocervical fistula 130
127.—Procedure for repair of vesicouterine fistula (a) . . . 131
128.—Procedure for repair of vesicouterine fistula (b) . . . 132
129.—Procedure for repair of vesicouterine fistula (c) . . . 132
130.—Procedure for repair of vesicouterine fistula (d) . . . 132
131.—Procedure for the sterilization of women 137
132.—Kelly procedure for the formation of a new urethra . . . 141
133-135.—Procedure for restoration of sphincteric control of the bladder 142
136.—Procedure for repair of ruptured bladder (a) 146
137.—Procedure for repair of ruptured bladder (b) 146
138.—Procedure for repair of ruptured bladder (c) 147
139.—Norris procedure for extraperitoneal exposure of the ureter . . 150
140-142.—Van Hook procedure for ureteroureteral anastomosis . . 151
143 and 144.—Guiteras procedure for ureterovesical implantation . . 152
145-147.—Sampson procedure for ureterovesical implantation . . 153

FIGURE PAGE
148 and 149.—Van Hook procedure for implantation of the ureter into the bladder 154
150 and 151.—Monari procedure for lateral anastomosis of the ureters 155
152-154.—Procedure for ureterointestinal implantation 156
155.—Single unipolar rupture of the kidney 157
156.—Multiple rupture of the kidney 159
157.—Crushed kidney without rupture of the capsule through which the organ feels like a sac of fluid 159
158.—Kelly procedure for exploration of the kidney 162
159.—Mayo-Robson procedure for exploration of the kidney . . . 164
160.—Lejars procedure for exploration of the kidney 164
161.—Israel procedure for exploration of the kidney 164
162.—Procedure for nephrectomy for multiple rupture of the kidney 165
163 and 164.—Procedure for resection of the kidney for unipolar rupture 166
165 and 166.—Procedure for hemostasis of ruptured kidney . . . 167
167.—Procedure for restoration of sphincter ani muscle after retroanal laceration (a) 169
168.—Procedure for restoration of sphincter ani muscle after retroanal laceration (b) 169
169.—Procedure for restoration of sphincter ani muscle after retroanal laceration (c) 170
170.—Procedure for restoration of sphincter ani muscle after retroanal laceration (d) 170
171.—Urethrocele 172
172.—Emmet procedure for redundant urethral mucous membrane . . 172
173.—Cystocele, showing cystic pouch filled with residual urine . . 174
174.—Partial prolapse of the uterus, great hypertrophy of the portio vaginalis, with complete prolapse of the bladder . . . 174
175.—Lips of the vulva retracted revealing the pouching bladder (cystocele) above and the pouching rectum (rectocele) below . 174
176.—The sound in the bladder demonstrating the cystocele and the finger in the rectum demonstrating the rectocele . . . 175
177.—Goffe procedure for repair of vesicocele (a) 176
178.—Goffe procedure for repair of vesicocele (b) 176
179.—Goffe procedure for repair of vesicocele (c) 176
180.—Goffe procedure for repair of vesicocele (d) 178
181.—Goffe procedure for repair of vesicocele (e) 178
182.—Goffe procedure for repair of vesicocele (f) 179
183.—Sutton procedure for repair of cystocele (a) 180
184.—Sutton procedure for repair of cystocele (b) 180
185.—Hirst procedure for repair of cystocele (a) 180
186.—Hirst procedure for repair of cystocele (b) 181
187.—Purse-string procedure for repair of cystocele 182
188.—Demonstration by catheter of cystocele with complete prolapse of the uterus 183

FIGURE PAGE
189.—Preliminary restoration of the bladder wall before operation for prolapse 183
190.—Boursier procedure for anterior colpohysteropexie . . . 184
191.—Method of closure 185
192.—Procedure for repair of anterior rectocele 187
193.—The normal position of the uterus with the bladder and rectum empty and the patient in the erect position 189
194.—The normal position of the uterus when the bladder and rectum are full 190
195.—The pelvic diaphragm, showing the relations of structures at the uterovaginal juncture 191
196.—The influence of gastrocoloenteroptosis in forcing downward displacement of the pelvic organs 193
197.—Atrophy of the concave wall and the elongation and hypertrophy of the convex wall of a retroflexed uterus 195
198.—Anterior displacement of the uterus 197
199.—Prolapse of the uterus with elongated and hypertrophied cervix 199
200.—Prolapse of the uterus with elongation and hypertrophy of the corpus and with some displacement of the bladder . . 199
201.—Complete prolapse of retroflexed uterus with marked prolapse of the bladder 199
202.—Küstner procedure for reposition of retrodisplaced uterus by bimanual manipulation (a) 205
203.—Küstner procedure for reposition of retrodisplaced uterus by bimanual manipulation (b) 205
204.—Küstner procedure for reposition of retrodisplaced uterus by bimanual manipulation (c) 206
205.—Küstner procedure for reposition of retrodisplaced uterus by bimanual manipulation (d) 206
206.—Küstner procedure for reposition of retrodisplaced uterus by combined digital and instrumental method (a) . . . 207
207.—Küstner procedure for reposition of retrodisplaced uterus by combined digital and instrumental method (b) . . . 207
208.—A long slender tampon with the fiber running lengthwise . . 208
209.—A chain tampon 209
210.—A bulbous tampon that generally does damage by traction on removal 209
211.—Two views of Smith-Hodge pessary 211
212.—Procedure for introduction of Smith-Hodge pessary (a) . . 211
213.—Procedure for introduction of Smith-Hodge pessary (b) . . 212
214.—Procedure for introduction of Smith-Hodge pessary (c) . . 212
215.—Kelly procedure for ventral suspension of the uterus (a) . . 214
216.—Kelly procedure for ventral suspension of the uterus (b) . . 215
217 and 218.—Fergusson procedure for shortening the round ligament 219
219.—Gilliam procedure for ventral suspension of the uterus by the round ligaments (a) 220

FIGURE PAGE
220.—Gilliam procedure for ventral suspension of the uterus by the round ligaments (b) 221
221.—Barrett procedure (modification of Gilliam) 222
222.—Mann procedure for shortening the round ligaments (a) . . 223
223.—A forceps with four approximating flat prongs, a half turn of which shortens the round ligament about two inches . . 224
224.—Baldy procedure for shortening the round ligaments . . . 225
225.—Coffey procedure for combined shortening of the round and broad ligaments (a) 226
226.—Coffey procedure for combined shortening of the round and broad ligaments (b) 226
227.—Coffey procedure for combined shortening of the round and broad ligaments (c) 227
228.—Goffe procedure for shortening the round ligaments by the vaginal route (a) 228
229.—Goffe procedure for shortening the round ligaments by the vaginal route (b) 228
230.—Thiriar-Reed procedure of cuneihysterectomy for flexion of the uterus (a) 231
231.—Thiriar-Reed procedure of cuneihysterectomy for flexion of the uterus (b) 231
232.—Thiriar-Reed procedure of cuneihysterectomy for flexion of the uterus 232
233.—Dudley procedure for straightening the cervical canal for anteflexion of the uterus 235
234.—Murphy (J. B.) procedure for vaginal proctectomy . . . 594
235.—Procedure for superior colporrhaphy (a) 240
236.—Procedure for superior colporrhaphy (b) 241
237.—Procedure for superior colporrhaphy (c) 241
238.—Displacement of the ovary into the cul-de-sac with adhesions to the peritoneum and to the ileum 244
239.—Berkeley and Binney procedure for replacement of displaced ovary (a) 249
240.—Berkeley and Binney procedure for replacement of displaced ovary (b) 249
241.—Longyear procedure for anchorage of the displaced kidney . . 261
242.—Posterior displacement of the rectum (posterior rectocele) demonstrated with the finger introduced into the rectum . . . 265
243.—Vaginal enterocele in which the hernial pouch is formed from the upper and posterior vaginal wall 267
244.—Procedure for vaginal enterocele by obliteration of the cul-de-sac of Douglas (a) 269
245.—Procedure for vaginal enterocele by obliteration of the cul-de-sac of Douglas (b) 269
246.—Ashton's case of a tent acting as a foreign body and perforating the anterior wall of the uterus 273

FIGURE PAGE
247.—Incision and method of isolating the ureter in ureterostomy by the extraperitoneal route 282
248.—Gonococcus infection of the Fallopian tube, showing round-celled infiltration with beginning suppuration in the stroma . . 305
249.—Small round-celled infiltration at times occurring beneath the mucosa, becoming generalized in the chronic process until the entire tubal wall becomes involved 307
250.—Type of hydrosalpinx that is often spoken of as tuboövarian cyst 311
251.—Development of constricting bands in infectious salpingitis . . 313
252.—How an infected tube and ovary may become adherent to each other and nested between the uterus and bladder . . . 314
253.—How an infected Fallopian tube may become distended almost to bursting point without developing adhesions . . . 316
254.—Distention of the isthmus of the tube suggestive of outward extension of the uterine cornu 316
255.—Procedure for vaginal puncture of pelvic abscess (a) . . . 335
255A.—Procedure for vaginal puncture of pelvic abscess (b) . . . 336
256.—Procedure for vaginal puncture of pelvic abscess (c) . . . 336
257.—Procedure for vaginal puncture of pelvic abscess (d) . . . 337
258.—Gauze drainage of the pelvis through abdominal incision . . 337
259.—Extraperitoneal through-and-through drainage 338
260.—Gauze drainage of the pelvis through abdominal incision . . 340
261.—A through-and-through abdominovaginal drain of gauze . . 341
262-264.—Convenient arrangement of tube for through-and-through abdominovaginal drainage 341
265.—Through-and-through abdominovaginal drain by tube . . . 342
266.—Procedure for salpingo-oöphorectomy (a) 347
267.—Procedure for salpingo-oöphorectomy (b) 347
268.—Procedure for salpingo-oöphorectomy (c) 348
269.—Procedure for salpingo-oöphorectomy (d) 348
270.—Procedure for salpingo-oöphorectomy (e) 348
271.—A slide mounted with pus of streptococcus salpingitis from one of Reymond's cases 373
272.—A section of fimbriæ from a case of salpingitis by Reymond and Magill 374
273.—Procedure for continuous intrauterine irrigation 382
274.—Procedure for conservative resection of the ovary . . . 385
275.—Tuberculous infection of the uterus, showing a section of the corporeal endometrium in which the epithelioid nodules are surrounded by small round cells with giant cells in their center with only remnants of the glands remaining . . . 393
276.—Tuberculous infection of the Fallopian tube 398
277.—A perfect Graafian follicle in the midst of ovarian stroma which was in a state of complete tuberculous infiltration . . 401
278.—Large giant cells noted in tuberculous ovary 401

FIGURE PAGE
279.—The mucous plug in the cervical canal that may be the cause of both obstructive dysmenorrhea and sterility 464
280.—Procedure for exploration of the pelvis of the kidney (a) . 478
281.—Procedure for exploration of the pelvis of the kidney (b) . . 478
282.—Guiteras procedure for internal exploration of the kidney . . 479
283.—Procedure for external drainage of the kidney by nephrotomy (a) 479
284.—Procedure for external drainage of the kidney by nephrotomy (b) 480
285.—Procedure for external drainage of the kidney by nephrotomy (c) 480
286.—Diagrammatic representation of different varieties of uterine myomata 494
287.—Evolution of different types of myomata 496
288.—Author's case of an aged patient from whom he removed a large interstitial fibroid of lateral development which had distended the broad ligament carrying the ovary and Fallopian tube of that side nearly to the umbilicus 497
289.—A large myoma of long standing removed from an elderly subject 498
290.—A large smooth myoma of the uterus, the contour of which is strikingly like that of an advanced pregnancy 503
291.—Pregnancy complicating multinodular myomata of the uterus in a case by the Ransohoffs, *père et fils* 510
292.—Harrison Cripps' case of myoma complicating pregnancy . . 511
293.—Procedure of myomectomy (a) 512
294.—Procedure of myomectomy by hemisection of the uterus (a) . 514
295.—Procedure of myomectomy by hemisection of the uterus (b) . 515
296.—Procedure of myomectomy by hemisection of the uterus (c) . 515
297.—Procedure for supravaginal hysterectomy (a) 517
298.—Procedure for supravaginal hysterectomy (b) 517
299.—Procedure for supravaginal hysterectomy (c) 518
300.—Procedure for supravaginal hysterectomy (d) 519
301.—Procedure for supravaginal hysterectomy (e) 519
302.—Schroeder procedure for supravaginal hysterectomy (a) . . 520
303.—Schroeder procedure for supravaginal hysterectomy (b) . . 521
304.—Schroeder procedure for supravaginal hysterectomy (c) . . 522
305.—Procedure for supravaginal hysterectomy by hemisection of the uterus 523
306.—Procedure for abdominal panhysterectomy (a) 525
307.—Procedure for abdominal panhysterectomy (b) 526
308.—Procedure for vaginal extirpation of submucous myomata . . 528
309.—The Thomas serrated spoon-saw 528
310.—Péan's forceps for morcellement 530
311.—Syncytioma malignum 535
312.—Typical adenoma malignum of the uterus as shown in Oliver's case 536
313.—Carcinoma of the vagina 541
314.—Carcinoma of the portio vaginalis 543
315.—The columnar epithelium replaced by that of a squamous type in the endometrium of a carcinomatous uterus 545

FIGURE PAGE
316.—Coexistence of sarcoma, carcinoma, myoma, and polypus . . 546
317.—Segond procedure for high amputation of the cervix (a) . . 568
318.—Segond procedure for high amputation of the cervix (b) . . 568
319.—Segond procedure for high amputation of the cervix (c) . . 569
320.—The Byrne apparatus, consisting of an electric forceps proper, conducting cables, and a storage battery 570
320A.—Byrne procedure of ignohysterectomy for carcinoma of the cervix 571
321.—Pryor traction forceps 575
322.—Wertheim procedure for complete extirpation of the uterus and pelvic lymphatics for carcinoma (a) 576
323.—Wertheim procedure for complete extirpation of the uterus and pelvic lymphatics for carcinoma (b) 577
324.—Wertheim procedure for complete extirpation of the uterus and pelvic lymphatics for carcinoma (c) 578
325.—Wertheim procedure for complete extirpation of the uterus and pelvic lymphatics for carcinoma (d) 579
326.—Improper method of enucleating the cervix after dividing its lymphatic connections on either side 580
327.—Improper procedure for enucleating the pelvic lymphatics after the uterus has been removed, the very point to be avoided in the Wertheim procedure 581
328.—Procedure for extirpation of urethra for carcinoma (a) . . 583
329.—Procedure for extirpation of urethra for carcinoma (b) . . 583
330.—Procedure for extirpation of urethra for carcinoma (c) . . 584
331.—Mayo (C. H.) procedure for transperitoneal removal of carcinoma of the bladder (a) 588
332.—Mayo (C. H.) procedure for transperitoneal removal of carcinoma of the bladder (b) 588
333.—Mayo (C. H.) procedure for transperitoneal removal of carcinoma of the bladder (c) 589
334.—Murphy (J. B.) procedure for vaginal proctectomy . . . 594
335.—Mayo (C. H.) procedure for abdominorectal proctectomy . . 597
336.—Halstead procedure for extirpation of the breast for carcinoma 600
337.—Rodman procedure for extirpation of the breast for carcinoma (a) 603
338.—Rodman procedure for extirpation of the breast for carcinoma (b) 603
339.—Rodman procedure for extirpation of the breast for carcinoma (c) 604
340.—Rodman procedure for extirpation of the breast for carcinoma (d) 606
341.—Sarcoma of the uterine cavity, with polypoid development and necrosis of the extended portion 615
342.—Retroperitoneal sarcoma that lifted the uterus and appendages nearly to the umbilicus 616
343.—Cystadenoma weighing 160 pounds 631
344.—Cystadenoma section, found to consist of a conglomeration of a greater or less number of cysts 632
345.—Cystadenoma of the ovary 633
346.—Cystadenoma of the ovary 634

FIGURE PAGE
347.—Hair follicles, sweat glands, and sebaceous glands from an ovarian embryoma (dermoid cyst) 639
348.—Dermoid cyst undergoing carcinomatous degeneration 644
349.—Procedure for ovariotomy (a) 655
350.—The Tait curved trocar 655
351.—Procedure for ovariotomy (b) 656
352.—Procedure for ovariotomy (c) 657
353.—Procedure for ovariotomy (d) 658
354.—Warren procedure for adenomata of the breast 663
355.—Cystomata growing from the fimbriæ of the Fallopian tubes . . 670
356.—A parovarian cyst developing between the folds of the broad ligament and, with its upper surface, lifting the Fallopian tube far above its normal locus 679
357.—Section from the wall of a parovarian cyst, showing the ciliated epithelial and underlying connective tissue layers 680
358.—Procedure for varicose veins of the broad ligament 694
359.—Procedure for extirpation of hemorrhoidal tumors by combined ligature and cautery method (a) 697
360.—Procedure for extirpation of hemorrhoidal tumors by combined ligature and cautery method (b) 698
361.—Procedure for extirpation of hemorrhoids by the clamp and cautery 699
362.—Procedure for extirpation of hemorrhoids by the clamp and cautery 699
363.—Progressive cutaneous atrophy of the vulva 703
364.—Newly developed anatomical relations in abdominal pregnancy . 721
365.—Procedure for immediate intervention in ruptured ectopic pregnancy 724
366.—A patient who had gone two months beyond term, maceration of the fetus having commenced 725
367.—Procedure for repair of ruptured uterus (conservative) . . 732
368.—Procedure for pubiotomy 736
369.—Cameron procedure for Cesarean section (a) 739
370.—Cameron procedure for Cesarean section (b) 740
371.—Cameron procedure for Cesarean section (c) 741
372.—Sänger procedure for Cesarean section (a) 742
373.—Sänger procedure for Cesarean section (b) 743
374.—Mann procedure for Cesarean section 744
375.—Dorsal flexed position 808
376.—Dorsal flexed position 808
377.—Left lateral prone (Sims) position 809
378.—Left lateral prone (Sims) position 809
379.—Knee-elbow position 810
380.—Knee-chest position 810
381.—Standing position 810
382.—Dorsal position with extreme flexure of the legs 811
383.—Extreme dorsal (Trendelenburg) position 811

FIGURE PAGE
384.—Procedure for bimanual examination of the pelvic organs, with the patient in the dorsal flexed position 816
385.—Sims speculum 817
386.—Gau speculum 818
387.—Nott trivalve speculum 819
388.—Gau speculum used as a self-retaining bivalve 819
389.—Duke hysteroscope 820
390.—Ross uterine sound 820
391.—Goodell dilator 821
392.—Aspirator 822
393.—Kelly conical urethral dilator 823
394.—Method of using the Kelly conical dilator, with the patient in the knee-chest position 824
395.—Kelly cystic speculum with obturator 824
396.—Method of using Kelly cystic speculum 825
397.—Mouse-toothed forceps 825
398.—A cystoscope with attachment for catheterization of the ureters . 825
399.—Method of inspection by Nitze cystoscope 826
400.—The Harris urine segregator 828
401.—The Harris urine segregator in situ, showing how the urines are collected separately from each kidney without the ureters being entered 828
402.—Martin procedure for non-instrumental proctoscopy (a) . . 830
403.—Martin procedure for non-instrumental proctoscopy (b) . . 831
404.—Thomas Charles Martin's anoscope 833
405.—The Martin proctoscope with notched and hollow obturator in position 833
406.—Martin procedure of instrumental proctoscopy. Position No. 1 834
407.—Martin procedure of instrumental proctoscopy. Position No. 2 834
408.—Martin procedure of instrumental proctoscopy. Position No. 3 835
409.—Martin procedure of instrumental proctoscopy. Position No. 4 835
410.—The rectal hook 836
411.—The proctoscope mirror 836
412.—Procedure for conjoined rectovaginal examination . . . 838
413.—Hemostatic forceps 844
414.—Ordinary scalpel 844
414A.—Scalpel with thin detachable blade 844
415.—Dissecting forceps 844
416.—Dissecting forceps 845
417.—Needle holders 845
418.—Packer 845
419.—Cullen's tenaculum 845
420.—Sponge holders 845
420A.—Péan's forceps for morcellement 845
421.—A full curved aneurysm needle 846
422.—Author's obliquely curved needle 846

FIGURE PAGE
423.—Simon's speculum 846
424.—Bozeman's long dressing forceps 846
425.—Tenaculum 847
426.—Newman reverse-acting, self-locking volsella 847
427.—The Allis ether inhaler, which is a cylindrical or ovoid cover around a grated case, from the gratings of which layers of cloth pass from side to side 849
428.—Esmarch's chloroform inhaler 849
429.—Point of puncture for spinal anesthesia 851
430.—Abdominal quadrants 856
431.—Anterior abdominal incisions 857
432.—Transverse infraabdominal incision of Pfannenstiehl . . . 859
433.—Procedure for making abdominal incision (a) 860
434.—Procedure for making abdominal incision (b) 860
435.—Procedure for making abdominal incision (c) 861
436.—Procedure for making abdominal incision (d) 862
437.—Procedure for closure of the abdominal incision by laminated suture (a) 862
438.—Procedure for closure of the abdominal incision by laminated suture (b) 863
439.—Procedure for closure of the abdominal incision by laminated suture (c) 863
440.—Procedure for closure of the abdominal incision by laminated suture (d) 864
441.—Retraction of the subcutaneous after application of subcuticular suture 864
442.—The needle, in passing through the abdominal wall, made to define the arc of a circle 864
443.—Layers to be included in each loop of a figure-of-eight suture . 865
444.—The deep subcuticular approximation of suture to control the fatty layer 865
445.—The needle devised by Dr. J. B. S. Holmes 865
446.—A convenient bandage made of firm, coarse cotton goods . . 868
447.—Beds with segmented mattresses that greatly facilitate the work of nursing 870
448.—Convenient arrangement of mattresses for continuous irrigation . 871

DISEASES OF WOMEN

SECTION I

MALFORMATIONS

CHAPTER I

MALFORMATIONS OF THE VULVA

Malformations of the vulva, resulting from disturbances of its elements in the embryonal stage of its development, are not clearly classified, because the embryology of the subject is less clearly understood.

Anatomical Considerations.—The external organs of generation are derived from the genital tubercle, which appears at about the sixth week of fetal life and reaches its maturity during the succeeding two weeks. After the development of the genital folds, and at the end of the second month, there is recognizable on its posterior surface a furrow extending in the direction of the cloaca and designated the genital groove.

This is the beginning of sex development, the subsequent steps of which, as outlined by Pozzi, are as follows: "The genital groove does not close more in front than behind, and thus the female lacks the clitoridian portion of the urethra; and this canal in the adult opens at a point homologous with that where it was found in the fetus of eight weeks—a disposition which is found in the male when the proper development of the parts has been arrested (hypospadias). The corpus spongiosum of the urethra, the product of the erectilized borders of the genital furrow, is also completely developed in the male, and entirely surrounds the canal in the pendulous portion. But in the female it aborts in the intermediate or vestibular portion, being reduced below to its two extremities, extending to the bulb of the vestibule, homologue of the bulb of the male urethra, but divided by the persistent genital opening; and above it forms the glans of the clitoris, which covers the corpora cavernosa clitoridis, homologues of the similar structures in the male penis. At the internal part of the bulb of the vestibule there are vestiges of a membranous organ, which reaches its full development in the male—namely, the bulb of the urethra; it is this which forms the hymen. Above, joining bulb and hymen to the clitoris and representing the vertical or cylindrical portion of the masculine corpus spongiosum, there is in the female a band with a vascular bundle running into it, the frænum masculinum vestibuli."

ABSENCE AND ATRESIA OF THE VULVA

Absence of the vulva in the sense of absolute non-existence of its structures probably does not exist. In what seems to be absence of the vulva the skin, in extreme cases, passes in a smooth plane from the pubis to the coccyx. In less extreme cases the vulval structures really exist, but their identity is obscured by adhesions that amount to mergence of the labiæ into an apparently homogeneous structure. This fusion may be so complete as to cause atresia of the vulval fissure and of the vaginal orifice.

Diagnosis.—There is an apparent absence of the vulvar cleft. A small opening exists anteriorly from which the urine issues, sometimes with considerable difficulty. At puberty trouble may arise through the retention of blood in the vagina; but, if the opening is large enough to permit the escape of the menstrual fluid, the discovery of the anomaly is postponed till marriage, when attempts at penetration by the husband may succeed in breaking down the labial adhesions or may require to be supplemented by the knife of the surgeon. It is noteworthy that, while this atresic condition may prevent coitus, it is not a complete obstacle to impregnation.

1. PROCEDURE FOR ATRESIC VULVA

(1) If the fusion of an atresic vulva is not too pronounced the proximal surfaces may be dissected apart, although the restoration of epithelium to such denuded surfaces cannot be accomplished.

(2) It is of special importance to free the glans clitoridis from its adherent prepuce.

(3) The vulvar cleft should be restored and any remaining occlusion or stenosis of the vaginal orifice should be corrected. Extreme care is required to prevent reagglutination of the separated surfaces.

(4) Following operation a glass obturator should be worn in the vagina until recovery is complete.

FUSIONS OF THE CLITORIS

Preputial fusions, or adhesions between the prepuce and the clitoris, may exist independently of the condition just described. This not uncommon condition is generally of antenatal origin, and in some instances the absence of interposed epithelium indicates that the union is an actual fusion. In the majority of cases, however, the skin is well formed at the preputial fold, the resulting secretion being incarcerated by the more or less marginal adhesions.

Diagnosis.—The prepuce clitoridis ought always to be inspected by the attending physician and by the nurse, when adhesions can be readily detected. When such careful inspection is not practiced it ought to be prompted by otherwise unexplainable irritation of the vulva in infancy; later by painful vulva, nocturnal enuresis, sexual hyperesthesia, and often masturbation. St. Vitus' dance and other general nervous states are often induced by this condition.

2. PROCEDURE FOR FUSION OF THE CLITORIS

(1) The adhesions should be thoroughly broken up under anesthesia.

(2) Pack the preputial fold with a shred of gauze.

(3) Care should be taken in the after-treatment to avoid readhesion in the process of healing. To this end the parts should be carefully separated and cleansed three times daily for ten days.

DOUBLE VULVA

Cases are on record in which individuals, otherwise single in formation, possessed two vulvæ situated side by side in the interfemoral space. In two of these there was an imperforate condition of the anus, the rectum opening into the vulva or into the vagina.

Treatment.—Treatment in these cases consists in a judicious ablation of supernumerary structures, for the purpose of having the parts conform as nearly as possible to the normal type.

INFANTILE VULVA

Infantile vulva implies an arrest of vulval development in infancy. The parts are relatively smaller than the other structures of the body. The condition is generally associated with similar lack of development in the vagina, uterus, adnexa, and the breasts.

Treatment.—No treatment can assure the resumption of development in these parts, although the stimulus and enforced functional activity incident to marriage have been followed by vast improvement. It should be remembered, however, that this is a dangerous expedient, as early and violent attempts at coition may be followed by lacerations and violent hemorrhages.

PSEUDO-HERMAPHRODITISM

Superficial vulval atresia, already described, is sometimes associated with hypertrophy of the clitoris and descensus or hernia of the ovaries into the labia majora. This condition can easily be mistaken for male hermaphroditism. Confusion of sex with preponderating male characteristics may be distinguished from the condition just described by remembering that, according to Ballantyne, this form of so-called hermaphroditism is, in fact, a perineoscrotal hypospadias. In such cases the imperforate penis, often atrophic, resembles the clitoris; the urethra opening at the base of this rudimentary penis resembles the female meatus urinarius at the base of the vestibule; and the short vestibular canal, which may even be guarded by a hymen, simulates the vaginal orifice in a very striking fashion. Nondescent or atrophy of the testicles, enlargement of the mammary glands, and the exhibition of acquired feminine traits may all combine to make the question of the sex of the hypospadic male one of the greatest difficulty. When it is added that cases have occurred in which the individual not only possessed a uterus, but also suffered every month from a sanguineous discharge from it, the discovery of the true sex, only after post-mortem microscopic examination of the genital glands, can be quite well understood. The testicles in such cases often show pathologic changes.

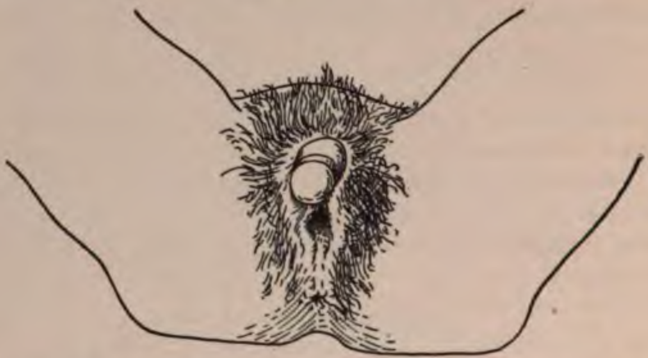


FIG. 1.—GOFF'S CASE OF PSEUDO-HERMAPHRODITISM SHOWING PENIS-LIKE DEVELOPMENT OF THE CLITORIS AND VAGINAL ORIFICE.

Treatment.—Operative treatment in a given case must be based upon its individual characteristics. Superficial vulval atresia, which is the leading anomaly in most of these instances, may call for perforation after puberty, when blood accumulates in the vagina. In instances in which the vagina is absent or rudimentary, and in which the female elements preponderate, a vagina for copulative purposes may be made when required by marital relations. Cases of true hernia of the ovaries should be explored through the abdomen and pelvis before an external incision is made. There can be no question as to the justifiability of removing any organs that are without functional possibility, but are either an actual or a potential source of danger to the patient.

Goff has reported an interesting case of feminine pseudo-hermaphroditism (Fig. 1), in which penis-like development took place with the growth of pubic hair at fifteen years of age. The clitoris, three inches long, was impervious. The rudimentary vagina, from which there had been no menstrual flow, was four and a half inches in depth. The meatus urinarius was just under the margin of the pubis. He operated by removing the clitoris, which had become the offending organ (Fig. 2), and by enlarging the vagina, using the redundant skin from the clitoris to cover the gap at the orifice of the vagina.

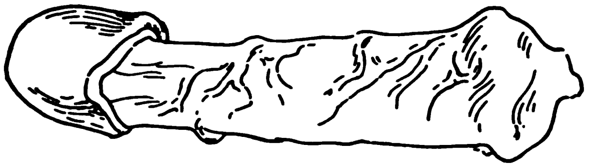


FIG. 2.—CLITORIS REMOVED FROM GOFF'S CASE OF PSEUDO-HERMAPHRODITISM. ACTUAL SIZE 9 CM.

CHAPTER II

MALFORMATIONS OF THE VAGINA

The Hymen.—The *normal hymen* defines the orifice of the vagina. It is composed of two lamellæ, the outer one being derived from the vulval integument, the inner from the vaginal membrane. It is a structure of marked elasticity, and is provided with capillary vessels and nerves that communicate with the papillæ of its epithelial investment. Ballantyne describes the structure as a developmental relic, varying in form and structure, that arises from the breaking down of the tissue between the sinus urogenitalis and the lower end of the Müllerian vagina, with possibly contributions from the Wolffian bulbs. In addition to the familiar crescentic fold at the posterior margin of the vulvavaginal juncture, it consists of a mesial band running forward on both sides to the clitoris, thus forming a sort of collar for the meatus urinarius.

ATYPICAL HYMEN

The hymen is absent only in monstrosities in which the external genitalia are absent. The hymen may have two openings. It is sometimes thought to be double, but such cases are probably examples of atresia of the vagina. It may be circular instead of crescentic, or it may be either notched (denticulate), projecting (infundibulate), or fimbriated. There may be equal openings, one on either side of a septum. In elderly primiparæ it may be tough and resistant, proving an embarrassing impediment to both copulation and parturition. In some such cases the laceration caused by first attempts at coition causes hemorrhage that may be alarming. In some instances the anterior extension of the hymen is atypically preponderating. Anomalous bands sometimes involve the urethra, causing incontinence of urine.

Symptoms.—The symptoms already enumerated should induce a careful examination, including inspection of the parts, when the exact condition is readily detected.

Treatment.—Treatment is necessarily surgical and involves such procedure as will restore the hymen as nearly as possible to its typical form.

IMPERFORATE HYMEN

(Atresia Hymenalis)

The usual opening in the crescentic hymen may be absent, with resulting complete occlusion of the orifice of the vagina. It is probable that in a majority of cases the so-called imperforate hymen is in reality an instance of atresia of the vagina.

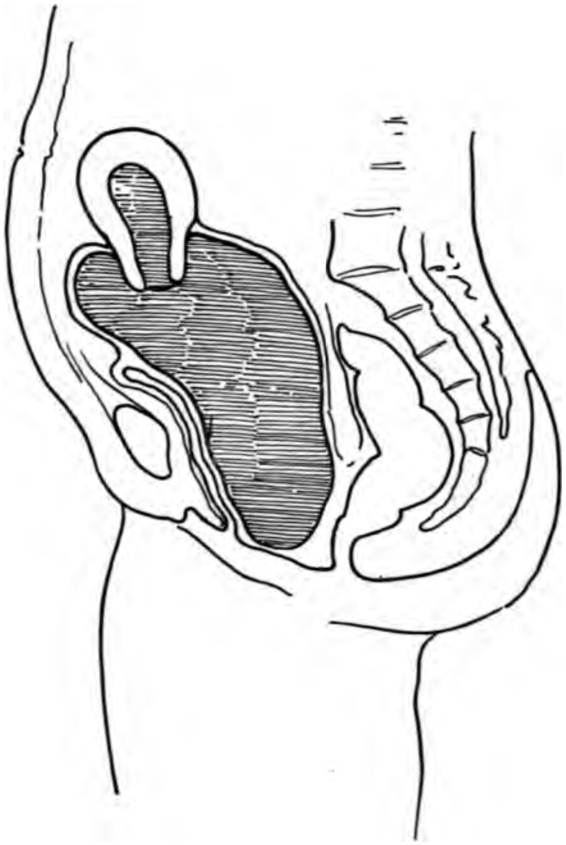


FIG. 3.—IMPERFORATE HYMEN WITH RESULTING ACCUMULATION OF MENSTRUAL FLUID (HEMATOCOLPOS) CAUSING DILATATION AND HYPERTROPHY OF THE VAGINA AND UTERUS.

Symptoms and Diagnosis.—During infancy and early life mucous secretion may accumulate in the vagina, causing pain and distention. In the greater number of cases, however, active symptoms do not appear until after puberty. Then the pain becomes pronounced and persistent, with sharp recrudescences, colicky in character, at each menstrual period. If the true condition is not detected the menstrual fluid continues to accumulate until there is marked distention, not only of the vagina, but of the uterus (Fig. 3). This distention is associated with more or less actual hypertrophy of both the vagina and uterus. There is liable to be vicarious hemorrhage from the nose, bladder, or bowel during the intermenstrual period. Physical examination will reveal tumefaction with tenderness and muscular rigidity above the pubes, and an impervious ostium vaginæ with a tense, bulging, and fluctuating membrane in the vulval fissure.

3. PROCEDURE IN CASES OF IMPERFORATE HYMEN

The first indication is to evacuate the accumulated fluid. This, in one of my cases, amounted to two and a half liters. It was formerly thought necessary, in extreme cases, to make a very small puncture, through which the dark, thick, tenacious, tar-like fluid would trickle slowly. This is probably never necessary.

(1) It is better to give the patient a short gas-oxygen anesthesia and open the membrane freely.

(2) Wash out the cavity thoroughly with warm normal salt solution.

(3) If the hymen persists as a hard ring it ought to be dissected out around its whole circumference.

(4) The annular incision thus formed should then be closed by interrupted sutures.

ABSENCE OF THE VAGINA

Absence of the vagina generally occurs in connection with similar absence of the clitoris, uterus, and appendages. The author has had one case, however, in which the clitoris and sexual sensibility were well developed, but in which, at twenty-two years of age, there had been no manifestation of the menstrual impulse, but in which, following the establishment of a vagina or sulcus for connubial purposes, marriage ensued. Two years later the patient had violent ovarian pains every twenty-eight days. An abdominal section revealed rudimentary ovaries, which were removed, and an even more rudimentary uterus, which was left.

4. PROCEDURE IN CASE OF CONGENITAL ABSENCE OF VAGINA

(1) The operation in this case consisted in making two pyramidal flaps, one with the base upward, the other with the base downward (Fig. 4). This dissection was carried through the skin and fascia.

(2) The transversus perinei muscle was then split transversely to the pelvis.

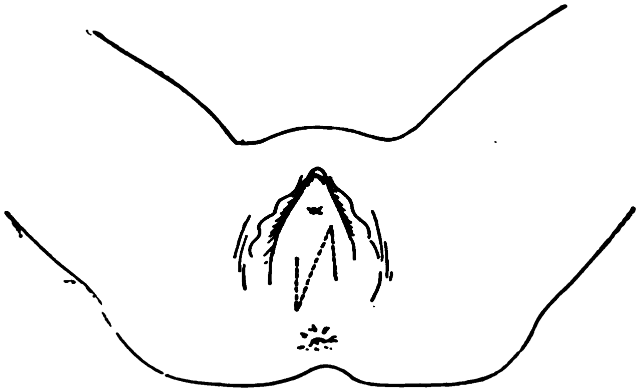


FIG. 4.—(4) PROCEDURE IN CONGENITAL ABSENCE OF VAGINA. (a) Dotted line showing line of external incision.

(3) The septum was divided by the finger to a depth of about four inches. The finger should be kept in the rectum during this procedure as a guide against entering that canal and thus forming a fistula.

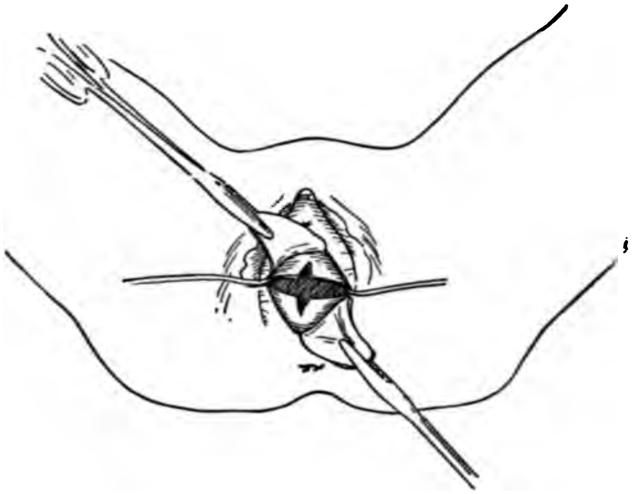


FIG. 5.—(4) PROCEDURE IN CONGENITAL ABSENCE OF VAGINA. (b) Flaps are dissected back and dissection made between rectum and bladder.

(4) The fibers of the muscle were then niched to the depth of about a quarter of an inch, the upper niche being a little to the right, the lower a little to the left, of the middle line (Fig. 5).

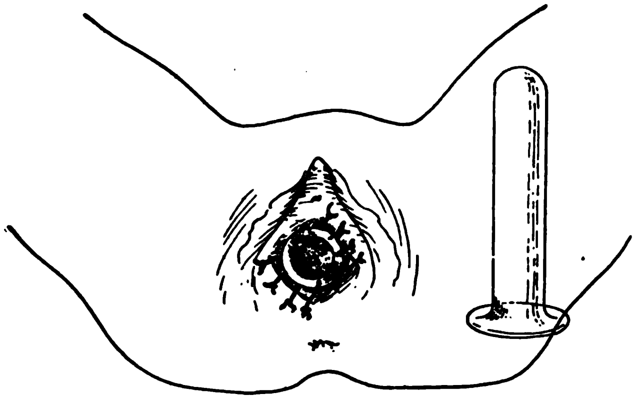


Fig. 6.—(4) Procedure in Congenital Absence of the Vagina. (c) The flaps have been backed into the vaginal slit, the denuded surfaces at either side have been secured by a few sutures, and a glass tube (rectal dilator) has been introduced into the newly made vagina. The drawing at the right shows the tube.

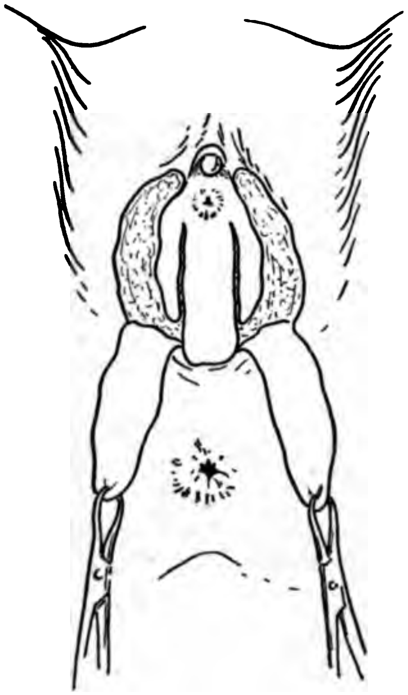


Fig. 7.—(4a) Fergusson Procedure for Congenital Absence of the Vagina. (a) Procedure for making artificial vagina, showing central flap for anterior wall and two lateral flaps for posterior wall.

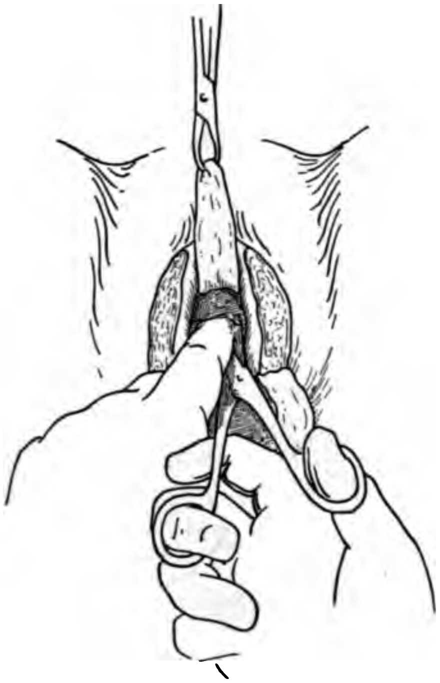


Fig. 8.—(4a) Fergusson Procedure for Congenital Absence of the Vagina. (b) Dissection being made for vaginal slit in the vesicorectal septum.

(5) The flaps were then tucked into the slit, each being anchored at its tip with a chromicized gut suture.

(6) A glass obturator (rectal dilator or test tube will do) (Fig. 6) was then inserted and worn for two weeks. Both flaps survived.

4a. FERGUSSON PROCEDURE FOR CONGENITAL ABSENCE OF THE VAGINA

(1) Fergusson's procedure differs from the foregoing in that it contemplates three flaps—a central one with its base forward, and two lateral ones with their bases to the back (Fig. 7).

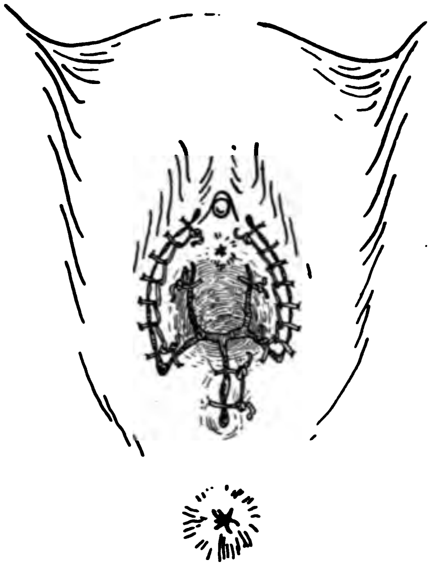


Fig. 9.—(4a) Fergusson Procedure for Congenital Absence of the Vagina. (c) Closure of external wounds after the flaps have been fixed in the vaginal slit.

(2) The septum is then split.

(3) The flaps tucked in (Fig. 8).

(4) The denuded edges stitched (Fig. 9).

4b. FARGAS PROCEDURE FOR CONGENITAL ABSENCE OF THE VAGINA

(1) A letter H incision is made with its transverse bar coincident with the line where the ostium vagina ought to be (Fig. 10).

(2) The vesicorectal septum is divided by blunt dissection for a

depth of about 10 cm., the dissection being carried laterally around the side of the rectum and the vagina.

(3) A large glass obturator is worn until the new canal is lined with cicatricial tissue.

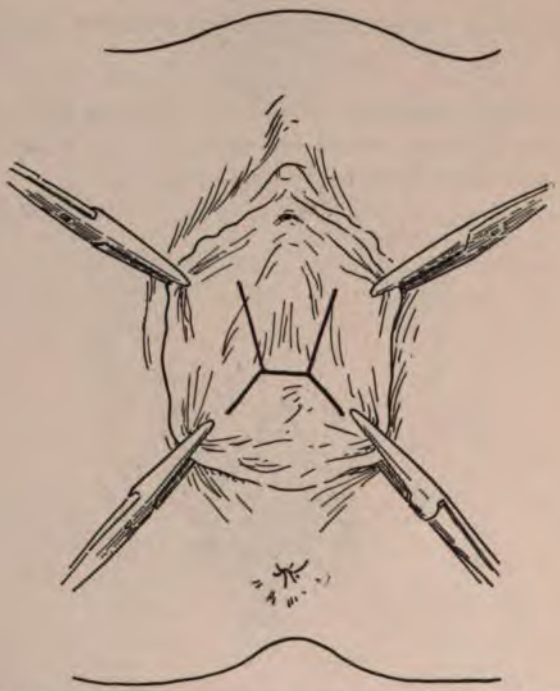


Fig. 10.—(4b) **Fargas Procedure for Congenital Absence of Vagina.** Lines of incision.

4c. BALDWIN PROCEDURE FOR ESTABLISHMENT OF COITIONAL VAGINA IN CONGENITAL ABSENCE OF THAT CANAL

(1) With the patient in the lithotomy position make the opening for the new vagina in the usual way by a transverse incision in the perineum, and careful separation of the bladder and rectum up to the peritoneum. Make this opening of ample size. Introduce a good-sized hemostatic forceps, held in place by packing in gauze.

(2) Open the abdomen in the usual way, the patient being in the Trendelenburg position. Bring up the lower end of the ileum, and determine that its mesentery is long enough to enable this part of the bowel to be drawn down into the vaginal opening. (If the mesentery is too short, the sigmoid can be brought down instead, but that has never yet been found necessary.) Press the intestinal contents out

of about 12 or 14 inches of the bowel, and then cut the bowel across so as to leave enough attached to the cecum to permit of anastomosis. Each end of this piece of intestine is then inverted with purse-string suture, and the mesentery incised toward the root, being careful not to injure its vessels.

(3) Reëstablish the continuity of the bowel by end-to-end or lateral anastomosis.

(4) The peritoneum over the end of the hemostat previously introduced into the vagina is now incised, and an assistant, pushing the hemostat upward, catches the middle of the detached loop and draws it down into the vagina as far as the mesentery will permit (Fig. 11).

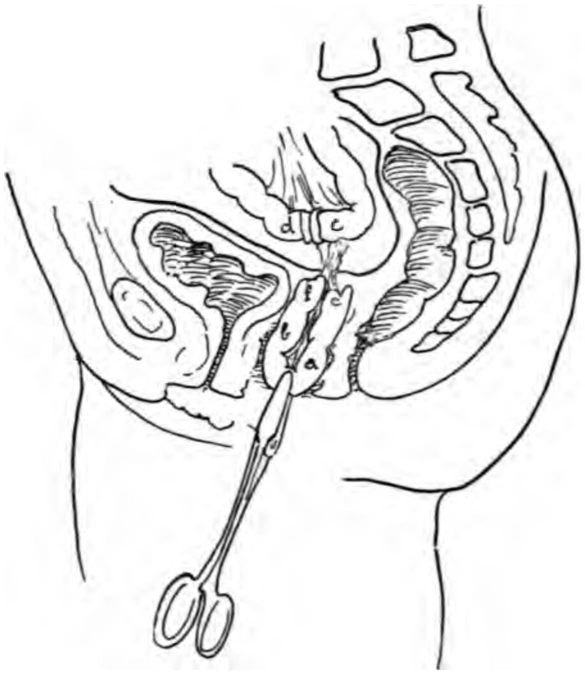


FIG. 11.—(4c) BALDWIN PROCEDURE FOR CONGENITAL ABSENCE OF THE VAGINA. (a) The dissection has been made through the vesicorectal septum and a loop of ileum (*a–b*) seized with the forceps. Dotted lines indicate points of excision (*c–d*).

The peritoneum is then caught around the bowel and mesentery, so as to leave a smooth floor to the pelvis. (The remains of the uterus, if any, have been previously removed if in the way, and the condition of the tubes, ovaries, appendix, etc., determined.)

(5) Close the abdomen as usual.

(6) Patient is again placed in the lithotomy position, the bowel opened where caught by the hemostatic forceps, the cavity of each leg of the bowel wiped out and packed with gauze, and the edges of the opening in the bowel sutured to the edges of the skin in the perineum (Fig. 12).

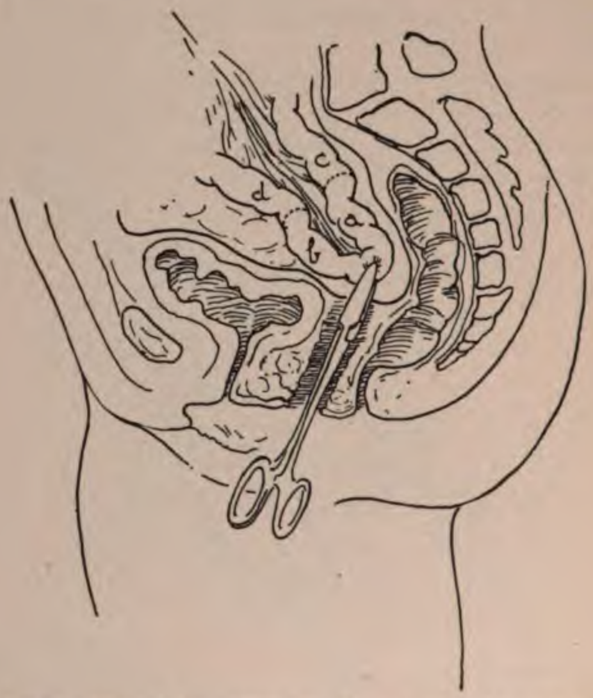


FIG. 12.—(4c) BALDWIN PROCEDURE FOR CONGENITAL ABSENCE OF VAGINA. (b) The loop of ileum has been closed at both ends (*e–f*) above and (*a–b*) drawn down to the vulval orifice preparatory to fixation. The ileum (*c–d*) has been anastamosed.

(7) The packing can be renewed as necessary, and at the end of two or more weeks the septum between the two segments of bowel can be removed by clamp pressure, thus completing the operation.

This procedure seems so rational, and attended with so little danger, that it will probably supersede all other methods.

DOUBLE VAGINA

Double or septate vagina, according to Ballantyne, is a term that, if strictly construed, would imply two uteri and two vulvar apertures in addition to the two vaginæ; cases that are exceedingly rare, and must be grouped among the double monstrosities. On the other hand, septate vagina, which is usually named "double" vagina, is much more common. It is due to want of fusion of the two Müllerian ducts in their lower part; it is not, therefore, an anomaly by excess, but by defect—an arrested development. The septum generally runs anteroposteriorly, when, of course, the vaginæ are situated laterally; rarely the canals lie one in front of the other and the septum is transverse. The septum may be complete and may extend from a point above and between the two cervices, when they exist, to the vulvar aperture, where it may subdivide that orifice and produce what is called a *hymen biforis;* on the other hand, it may exist in the upper part of the vagina alone, or in the lower part alone, or it may show a varying number of perforations.

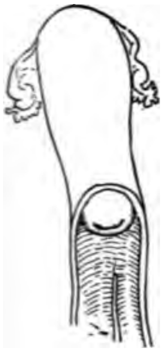


Fig. 13.

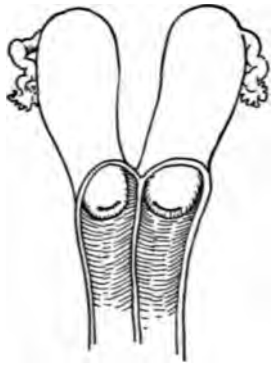


Fig. 14.

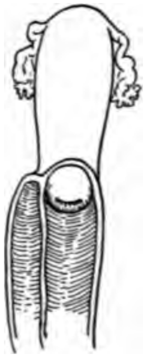


Fig. 15.

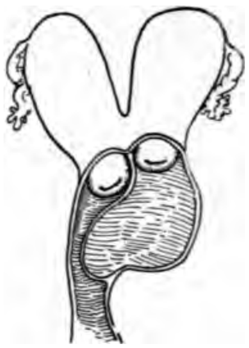


Fig. 16.

Fig. 13.—Partial Septate Vagina with Single Uterus.
Fig. 14.—Complete Septate Vagina in Double Vagina with Double Uterus.
Fig. 15.—Complete Septate Vagina or Double Vagina with Single Uterus.
Fig. 16.—Partial Septate Vagina with Double Uterus, One Rudimentary Vagina being Occluded with Resulting Retention (unilateral hematocolpos).

One-half of a septate vagina may be imperforate; in rare cases both sides are imperforate. These variations may give rise respectively to unilateral and bilateral hematocolpos. When unilateral this condition has been called *atresia vaginæ lateralis* (Figs. 13, 14, 15, 16).

In all cases in which an elastic swelling is found in the vaginal wall the possibility of its being an imperforate half vagina communicating with a functionally active half uterus should be borne in mind. In a case by Muret the better developed half was imperforate and the more rudimentary one was patent. Sometimes the imperforate half communicates with the patent half by means of a small opening, when dysmenorrhea may exist without complete retention of the menses. Both halves have been known to open into the urethra.

Symptoms and Diagnosis.—In many cases septate vagina is not even suspected until it is discovered as a complication of parturition. It then happens that the accoucheur discovers at one examination that he can feel the parturient cervix; at the next it cannot be found at all. Investigation then leads to the discovery of a septum, on one side of which is the parturient canal, leading either into a blind pouch or, possibly, to a rudimentary cervix. When, after puberty, an atresic half of a septate vagina leads to a functionally capable uterus, the resulting lateral hematocolpos is manifested by a fluctuating tumor presenting at the upper part or at the side of the patulous half of the canal. Under these circumstances the usual pain, tenderness, and distention and rigidity of the abdominal muscles, incident to atresia of the vagina, are the chief causes of complaint. By combined examination through the vagina and rectum, or with a finger in one or the other of these canals and the other hand over the lower abdomen, the mass can generally be outlined. In certain instances it may be necessary to conduct this examination under anesthesia.

5. PROCEDURE FOR DOUBLE VAGINA

If the septum is an obstruction to delivery it should be divided with the scissors up to its point of union with the parturient cervix. Although this is ordinarily not a difficult operation, or one associated with hemorrhage, it ought not to be undertaken without preparations having been made to meet any emergency that may arise. The same procedure with the same precautions should be undertaken when the condition is a barrier to copulation. When an atresic half of a double vagina with a double uterus has become the seat of menstrual retention, the septum should be freely divided up the cervix that may be first presenting.

STENOSIS OF THE VAGINA

Stenosis of the vagina means an abnormal narrowing at any part of that canal. In certain cases this narrowing may exist at several points. Ballantyne has pointed out that when the stenosis is general, it probably means that we have to do with a half vagina derived from one Müllerian duct, the other half being undeveloped, or at least imperforate. Then the condition may be associated with the uterus unicornis or bicornis, possibly with one cornu rudimentary. In other cases the stenosis is annular, and consists of one or more perforated diaphragms, a condition which may have been produced by adhesive colpitis in infancy or in fetal life, but which more probably represents incomplete canalization of the vaginal *anlage*. Dyspareunia may result at the time of marriage, or delay may occur during the second stage of labor, and the anomaly thus be brought under the notice of the gynecologist.

Diagnosis.—Painful coition or inability to copulate at all are generally the first indications. Sometimes indefinite vaginal pains with irritability of the bladder are complained of, while constipation may aggravate these symptoms. In many instances, especially where the lesion is located high, the condition is not suspected until it offers a barrier to parturition, when it may be mistaken for a rigid os. Ashton speaks of a reflex pain that is sometimes felt in other organs, notably in the epigastric region and under the left mammary gland. The diagnosis is readily made by physical exploration.

6. PROCEDURES FOR STENOSIS OF THE VAGINA

Partial stenosis may be overcome by repeated efforts at coition. Where the constriction is annular and not extensive a few incisions through the ring at different points may be sufficient, if an obturator is worn constantly during convalescence, or if marital relations are resumed shortly after operation. In more extensive cases, or in those in which the ring is very dense, it should be dissected out and the mucous margins brought together by interrupted sutures.

ATRESIA OF THE VAGINA

Atresia, or complete occlusion of the vagina, may be either complete or incomplete. Ballantyne has pointed out that only a fibromuscular band may be found between the bladder leading up to a normal uterus. When the lower third of the canal alone is present it is surmised that it is not Müllerian, but derived from the vestibular sinus; its upper boundary would be composed of the lower imperforate end of the Müllerian vagina, or (if the theory of Hart is accepted) of the persistent Wolffian bulbs. The malformed state of the vagina is commonly associated with anomalies in the other genital organs, both internal and external; thus the uterus may be ill developed or absent, and the Fallopian tubes and vulva may, but not so frequently as the uterus, be defective. On the other hand, the uterus and the other genitals may be normal in structure. Sometimes it is stated that the ovaries are absent, but in cases in which the vagina and ovaries are both absent the sex of the individual can hardly be regarded as female at all. If functionally active ovaries and uterus coexist with imperforation of the vagina, the supervention of puberty usually leads to the retention of blood, in a more or less altered state, in the uterus (hematometra) or tubes (hematosalpinx), or in the perforate part of the vagina (hematocolpos).

Symptoms and Diagnosis.—An imperforate condition of the vagina usually begins to attract notice when the individual reaches the age of puberty. As month after month goes past without any sign of the menstrual discharge, but with all the signs associated with menstruation (pain and weight in the pelvis, headache, swelling of the breasts, epistaxis, etc.), the patient's friends bring her to a medical practitioner. It is then found that the vagina is imperforate, and that there is distention in the hypogastric region, and, if the case is kept under observation, it may be noted that this swelling increases suddenly at recurring monthly periods, to diminish again slowly in the intervals. The examining finger passes into the vagina to a greater or lesser distance, according as the imperforation is high up or low down in the canal, but it never touches the cervix, and by the aid of the rectal touch, with a sound in the bladder, perhaps, it can be made out whether the uterus and adnexa are present or not, and whether there is menstrual retention in the uterus and tubes or not. In other cases of vaginal atresia the first symptoms to lead to medical intervention are those arising at the time of marriage, when coitus is found to be either impossible or incomplete and painful. In these instances the internal genital organs may be functionally quiescent, a fact which accounts for the absence of monthly suffering and for the late discovery of the vaginal anomaly.

Treatment.—The only means of relief in these cases is by means of operation. This must vary according to the location and extent of the atresia. If the occlusion is localized, then a simple crucial incision will serve to set free the more or less altered blood in the upper part of the canal; the evacuation should be carried out without haste, and strict surgical cleanliness observed. If, on the other hand, the atresia is extensive and the blood accumulation is far from the surface, very careful dissection will be needed before the cervix uteri is reached. With the sound in the bladder and a finger in the rectum, and using the handle of the knife or probe-pointed scissors, the operator will work upward toward the blood accumulation (whose position has been determined by rectal touch), will incise the sac, and endeavor, with the aid of flaps derived from the labia minora and perineum, to form a vaginal canal. P. Walton makes an H-shaped incision between the labia minora (Fig. 10).

7. WALTON PROCEDURE FOR ATRESIA OF THE VAGINA

(1) Dissect upward, and at once open into the peritoneal cavity (instead of avoiding it, as has been the custom) through the pouch of Douglas.

(2) Then pass the finger in and ascertain the condition of the uterus and adnexa.

(3) The opening in the peritoneum is then closed with catgut sutures.

(4) The construction of the artificial vagina is proceeded with. (Pro. 4, 4a, 4b, 4c.)

It is much safer in such instances to explore the pelvis by abdominal section, by which means it can be determined with greater accuracy whether or not subsequent steps should be addressed to an attempted restoration of fairly well-developed internal organs, or to the complete ablation of hopelessly rudimentary internal organs.

CHAPTER III

MALFORMATIONS OF THE UTERUS

Malformations of the uterus, as usually encountered, are best understood not only by a preliminary understanding of the typical morphology of that organ, but by an understanding of its consecutive but distinct stages of development. These stages are graphically described by Ballantyne as follows, viz.:

Anatomical Considerations.—The embryonic development of the organ takes place, roughly speaking, in the first three months of intrauterine life; it passes through three stages, in the first of which there exist the two Müllerian ducts as solid cords in the neighborhood of the Wolffian ducts (first month); in the second the ducts obtain their lumen and unite externally into one uterovaginal tube (second month); and in the third the ducts fuse internally into one hollow tube, the uterovaginal canal, their upper parts, however, remaining distinct, as the Fallopian tubes (third and fourth months). The fetal development of the uterus occurs during the remaining five or six months of intrauterine life, and chiefly consists in the formation of the fundus of the organ, the transition from the *uterus planifundalis* into the *uterus foras arcuatus*, or fetal uterus. Postnatal development takes place in two stages: in the first, corresponding to the first ten years of extrauterine

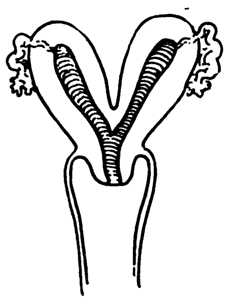


FIG. 17.
UTERUS DUPLEX.

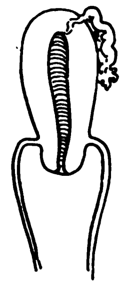


FIG. 18.
UTERUS UNICORNIS.

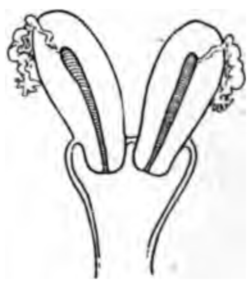


FIG. 19.
UTERUS BICORNIS.

life, through the greater growth of the body as compared with that of the cervix, the *uterus fœtalis* becomes the *uterus infantalis;* and in the second, which may be said to extend from the tenth to the sixteenth year, the infantile uterus takes on the characters of the adult but virgin organ.

Now, the majority of uterine malformations are simply stages of development normally temporary, but which have become permanent, and they may be divided into groups corresponding to the developmental stages which have been enumerated. These groups may be put in the form of a table:

Periods of life.	Groups.
Embryonic......	I. (*a*) Absence of uterus, complete, together with absence of tubes and vagina (very rare).
	(*b*) One-horned uterus, with no trace of the other horn (*uterus unicornis sine ullo rudimento cornu alterius*).
	II. (*a*) Externally double uterus (*uterus duplex sine didelphys; uterus bicornis*).
	(*b*) Solid or partly excavated uterus (*uterus solidus, uterus rudimentarius, uterus partim excavatus*).
	(*c*) Combination of (*a*) and (*b*) (*uterus duplex solidus, uterus bicornis rudimentarius*).
	(*d*) One-horned uterus, with other horn solid or partly excavated (*uterus unicornis cum rudimento cornu alterius*).
	III. Uterus divided internally more or less completely, without or with external signs of duplicity (*uterus septus, subseptus, uterus bicornis septus*).
Fetal...........	IV. Uterus with flat fundus, with or without complete or partial internal duplicity (*uterus planifundalis septus, subseptus, simplex*).
	V. Uterus with fetal character (small body, large cervix).
Postnatal.......	VI. Uterus with infantile characters (*uterus infantalis*).

Ballantyne calls attention to the fact that some malformations do not seem to fall within this scheme of classification. One of them, the trifid uterus or uterus accessorius, is specially difficult of embryonic explanation. To account for it we have to suppose the existence of a double Müllerian duct on one side; possibly arising in the preëmbryonic or germinal period. Congenital prolapsus uteri also, which may be grouped with the malformations, does not represent a stage in the development of the organ so far as is known; since, however, it has always been found associated with spina bifida, it may be really rather a concomitant anomaly of spinal arrested development than an arrest in the evolution of the uterus.

As to the cause of these arrests in uterine development there is still much darkness; inflammatory processes, e. g., fetal peritonitis, defective formation of the abdominal walls, e. g., umbilical hernia, the presence of tumor germs preventing union of the Müllerian ducts, and traction upon these ducts exercised by neighboring structures have all been adduced as possible teratogenic factors; but they are all insufficient to explain the anomalies which have arisen in the embryonic period of intrauterine life. It will probably be found that uterine malformations, like malformations and monstrosities of other parts of the body, are due to the action of germs, toxins, and poisons upon the tissues in the course of evolution.

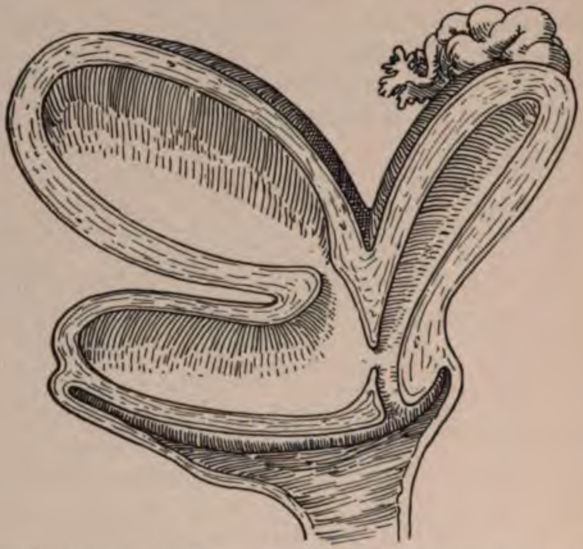


FIG. 20.—AN IRREGULARLY FORMED BICORNATE UTERUS WITH EACH HORN WELL DEVELOPED.

ABSENCE AND RUDIMENTARY DEVELOPMENT OF THE UTERUS

Absence of the uterus, in the sense of completeness, probably does not occur in the adult woman. Cases are, however, frequently encountered in which the uterus is rudimentary in degree, varying from a mere nodule to that which may be classified as infantile. While the organ may be said to be anatomically present, it is physiologically absent in these cases. The tubes and ovaries are also usually defective in these cases, although the vulval development may be normal, and a vestibular vagina may exist which may have been made deeper by attempts at coition.

Symptoms and Diagnosis.—The symptoms depend largely upon presence or absence of functioning ovaries. There is always necessarily amenorrhea; but, when there are functionating ovaries, menstrual molimina are met with; there are occasionally vicarious hemorrhages; and there may be a great deal of pelvic pain. Secondary sexual characters are generally present, but the vulvar hair may be defective. By means of a rectoabdominal bimanual examination (under an anesthetic if necessary), and with the help of a sound in the bladder, it can usually be made out that the uterus is seriously defective. In the marked cases no thickness of tissue can be felt between the rectum behind and the bladder in front.

Treatment.—*Medical.*—It is doubtful in these instances whether any treatment of the nature of ferruginous tonics and the like should be adopted, for such medication will only prove ineffective and disappointing to the patient.

Surgical.—If the pain incident to recurrent menstrual periods is severe, and if the general health is menaced from this cause, removal of the ovaries, whether rudimentary or not, has been urged. In one case I by preference removed the painful and incompetent uterus, leaving the ovaries. This put an end to constant distress with the monthly recrudescences. It saved the patient her sexual inclination, protected her from the nerve storms of the artificial menopause, and gave to her organism the possible benefit to be derived from the internal secretion of the ovary. This plan of treatment should be considered in all young subjects, in whom the connubial relations are anatomically and physiologically practicable, without reference to the possibility of reproduction.

THE INFANTILE UTERUS

The infantile uterus is not to be confused with the rudimentary uterus just described. The infantile uterus, while immature, is still anatomically a complete uterus, with possibilities of late development up to the point of some physiological capacity.

Symptoms and Diagnosis.—The infantile uterus is generally associated with poor mammary and vaginal development; with symptoms of defective ovarian formation, and sometimes with such systemic disorders as chlorosis. There is either amenorrhea or a scanty flow; sterility is met with, and there may be also dysmenorrhea. The vaginal and bimanual examinations, together with the introduction of the sound, should enable a diagnosis to be made, and the relation of the size of the body of the organ to that of the cervix will distinguish the fetal from the infantile type.

Treatment.—The treatment will be directed toward establishing the growth of the uterus, and this is far from hopeless in the infantile form. Marriage has sometimes a good effect, but should not be recommended unless the menstrual function has been established. In the unmarried reliance must be placed upon the administration of iron, arsenic, and quinin, together with nourishing food and gymnastic exercises; in the married electrical stimulation of the uterus or simply the periodical passing of the sound may be employed, but the insertion of a stem pessary, as recommended by many, is not free from risk and is of doubtful efficacy. In cases in which painful but futile efforts at menstruation increase in painfulness, and in their inroads on the general health, and in which after a sufficient length of time it has become apparent that the uterus cannot be developed to the point of reproductive capacity, it should be removed. The ovaries, if found normal, should be left.

SEPTATE UTERUS

(*Uterus Septus*)

A septum may divide the uterine cavity into two cavities. The septum thus formed may extend the whole or a part of the length from the fundus to the os uteri. Ordinarily the cervix is not thus divided.

Symptoms.—The clinical symptoms are indefinite; there may be amenorrhea and dysmenorrhea; or there may occur the curious twice-monthly recurring hemorrhage, which may be supposed to be menstruation from the two cavities of a non-synchronous type; and, if one of these discharges is small in amount and accompanied by pain, we have an explanation of one variety of the midpain or "Mittelschmerz." It is possible that a septate uterus may be a cause of habitual abortion; at any rate, in one case the division of the uterine septum was followed by a normal pregnancy. During curettage the curette has been known to pass from one cavity of a septate uterus into the other, giving the sensation of perforation of the organ. The presence of the septum may complicate labor in this form of malformation; it may cause a malpresentation or a low implantation of the placenta, or to it the placenta may be attached, in which case hemorrhage in the third stage is to be looked for. The diagnosis of this malformation has usually been made accidentally during the extraction of the placenta, or in turning.

Treatment.—The septum, if discovered, should be freely divided and the uterine cavity kept packed until the healing is complete.

DOUBLE UTERUS

(*Uterus Duplex*)

The double uterus, a malformation of extreme cavity, differs from the bicornate uterus in that the condition is one of two complete uteri.

Both may communicate with a single vagina (Fig. 19), or each may communicate with a vagina of its own. So far the cases reported have been those of unicornate uteri. Ameiss has reported a case in which pregnancy occurred; in one by Bernhard the uteri were fetal and, of course, sterile.

Symptoms and Diagnosis.—The condition may be symptomless. Fortnightly or other erratic menstruation may occur. If so, and if the menstruation from each uterus should be excessive, the resulting inroad on the health would be pronounced. Digital examination would reveal two cervices and bimanual examination two fundi. The condition could be further confirmed by the speculum and sound.

Treatment.—One uterus could be removed without interference with the functional powers of the other.

ONE-HORNED UTERUS

(*Uterus Unicornis*)

The uterus unicornis has but one horn or cornu. Ballantyne states that when there is a rudimentary horn it may either be solid or show a cavity, and under the latter circumstances pregnancy or menstrual retention may occur in that cavity. The one-horned uterus has no proper fundus, for it inclines to one side and tapers to a point, where it becomes continuous with the Fallopian tube (only one tube is usually present—Fig. 18). Concomitant malformations are: small vagina, vagina septa, absence of one kidney and ureter, rudimentary condition of the ovaries. Menstruation is not necessarily affected and pregnancy may occur in the single well-developed horn and pass to a normal termination; but, when there is gestation in the rudimentary horn, the rupture of the sac commonly happens with results practically indistinguishable from those found after the bursting of a tubal pregnancy.

Symptoms and Diagnosis.—This is a symptomless condition and is rarely discovered during life, unless accidentally in the course of surgical exploration of the pelvis.

Treatment.—The condition calls for no treatment, even after its accidental discovery.

TWO-HORNED UTERUS

(*Uterus Bicornis*)

In this variety of malformation there are two unicornate bodies of the uterus, which blend into a simple cervix and find an outlet through a single os (Fig. 17). The degree of separation of the two horns varies within wide limits, from a simple notch on the fundus to a wide interval. Further, the horns may be of the same or of different size and of different shapes (Fig. 20). In the interval between them may be seen a band stretching from rectum to bladder (rectovesical ligament). The external genitals are generally normal, but the vagina may show different degrees of duplicity (vagina septa, subsepta). One of the horns may be solid or partly imperforate, and in the latter case it may become the seat of a pregnancy or a menstrual blood accumulation (hematometra).

Symptoms and Diagnosis.—This condition is rarely discovered during life, but occasionally revealed by parturition, and is more often found accidentally in the course of abdominal or intrapelvic operations. It sometimes happens that, while menstruation may occur simultaneously from each cavity, according to Ballantyne, it may flow from one cavity one month and from the other the following month, or a discharge from each cavity each month, but not at the same time (fortnightly variety). Pregnancy, apparently, not uncommonly happens in the bicornate uterus; during it hemorrhage may go on from the unoccupied horn, or a decidual membrane may form in it; both horns may contain impregnated ova, and the age of gestation may not be the same in each, thus explaining some of the anomalous cases of superfetation; and, rarely, a twin conception may occur in one horn. Labor may be interfered with in various ways; there may be a malpresentation; there may be delay from the presence of the rectovesical band; there may be a low implantation of the afterbirth; and, as Halban has shown, in cases where the pregnant horn lies obliquely to the empty one the head of the infant may be driven during labor through the septum between the two cavities, and what was a left-sided fetus may be expelled through the right cervical orifice. The diagnosis of the uterus bicornis, like that of the septate organ, is often not made till labor supervenes or till the abdomen is opened for some purpose; but if a double vagina or a double os uteri exists the anomaly may be suspected, and then a careful examination bimanually and with two uterine sounds may suffice to make it plain.

Treatment.—There is no treatment unless disturbance of utero-ovarian function justifies terminating the functional life of the uterus, which can be done by abdominal hysterectomy. The ovaries, if normal, should be left.

CHAPTER IV

MALFORMATION OF THE FALLOPIAN TUBES

Malformations of the Fallopian tubes of congenital origin result from interference with the developmental process by which they are derived from the Müllerian ducts. Their *anlagen,* at first solid and cord-like, later become hollow and tubular, their lower limit being marked by the precursory *anlagen* of the round ligament. Below this level the Müllerian ducts unite, to form the uterus and vagina. It should be remembered that during fetal life each Fallopian tube is more or less tortuous, showing several spiral convolutions.

ABSENCE AND DEFECTIVE FORMATION OF THE FALLOPIAN TUBES

Both Fallopian tubes are absent only in extremely rare cases. This malformation may, indeed, be said to occur only in connection with absence of the uterus. The absence of one tube is of more frequent occurrence. It is generally associated with uterus unicornis. The statement that the corresponding ovary is always absent is disproven by a specimen submitted by Blot. Ballantyne ventures the rational conjecture that in these cases the ovary may be rudimentary, or may occupy an anomalous position, and, as a consequence, be overlooked at the time of exploration. Unilateral absence of the tube is not necessarily accompanied by interference with the reproductive functions, for Chavannaz has recorded the case of a woman of sixty who had menstruated regularly and had borne three children, and who yet possessed (as was found out at the autopsy) neither tube nor ovary on the right side. The kidney of the same side may also be wanting, as in Edridge-Green's case. The Fallopian tube may be absent in part, for Ballantyne and Williams have described a case of genital tuberculosis in which the outer two-thirds of the right tube was completely wanting, and the inner third ended in a tapering, cone-like extremity (Fig. 21).

Sometimes the tube shows its rudimentary development by its solid state or by imperforation of its abdominal end, anomalies which a knowledge of embryology makes it easy to comprehend. Another form which rudimentary development of the tube may take is persistence of the spiral convolutions, which are normally present in fetal life. It is doubtful whether these twists represent a return to the fetal state or a continuance of it; they must predispose to the occurrence of hydrosalpinx, and they may lead to sterility and dysmenorrhea.

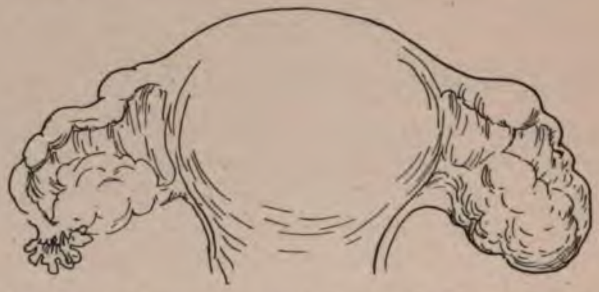


FIG. 21.—CONGENITAL ABSENCE OF THE OUTER THIRD OF THE RIGHT FALLOPIAN TUBE (Ballantyne's case).

Symptoms and Diagnosis.—There are no symptoms upon which the existence of this anomaly may be predicated. Diagnosis is made only at time of surgical exploration of the pelvis, or at autopsy.

Treatment.—There can be no treatment for absence of the Fallopian tubes, but in cases of defective formation it may be possible, by plastic methods, to make a physiologically effective oviduct.

8. PROCEDURE FOR ESTABLISHING THE PATULOUSNESS OF A CONGENITALLY OCCLUDED FALLOPIAN TUBE

(1) Bring the rudimentary Fallopian tube up into the abdominal incision, care being taken not to pinch the tube with forceps or otherwise subject it to violent mechanical pressure.

(2) Incise the tube longitudinally for about 3 millimeters at its distal and occluded extremity, the incision being carried through all layers until the lumen is exposed.

(3) Evert the wound in the tube by seizing the margins of the mucous membrane with forceps, bringing it out on each side and drawing it back over the peritoneal surface.

(4) Stitch the margins of the mucous membrane to the peritoneal surface, using some fine linen or silk for the purpose.

SUPERNUMERARY FALLOPIAN TUBES AND OSTIA

Cases of supernumerary or double tubes are exceedingly rare, but instances of accessory ostia, or of small tubes attached to the broad ligament, or to the Fallopian tube itself, are comparatively common. It is not difficult to understand why this should be so, for in the former case it is necessary to suppose the existence of two Müllerian ducts on one side, while in the latter the condition may be explained by anomalous development of a single duct. An example of true double tube (on the right side) was reported by Winckel; there was a third ovary lying in front of the uterus, and attached to it was a cord-like structure with a fimbriated end, which passed to the right side and was connected with the right Fallopian tube; the patient was sterile. The case described by Ruppolt must be looked upon as one of constriction of a Fallopian tube by fetal peritonitis, and not as true duplication of the tube.

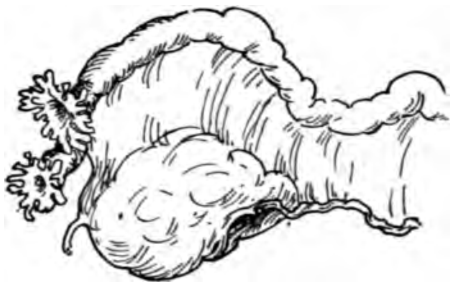


FIG. 22.—ACCESSORY OSTIUM OF THE FALLOPIAN TUBE (Ballantyne's case).

Accessory ostia and tubes are, as has been said, not so uncommon. Ballantyne and Williams met with two instances of accessory ostia in sixty-one pairs of tubes from consecutive post mortems at the Edinburgh Royal Infirmary. Usually one accessory ostium only is present (Fig. 22), and it is situated on the upper margin of the tube, not far from its normal ostium; but Ferraresi has put on record a remarkable case in which there were six ostia in all. They are either sessile on the normal tube or have longer or shorter pedicles connecting them with it. These pedicles may be hollow, and generally the ostia are surrounded by fimbriæ and communicate with the tubal lumen. They may arise either from imperfect closure of the groove in the germinal epithelium, which ultimately becomes the upper end of the duct of Müller, or from secondary opening of the duct after it has been closed. The structures which have been described must not be confounded with what have been called "tubal appendages" or "pedunculated tufts of fimbriæ." These are solid stalks bearing numerous fimbriæ on their free end, and they usually spring from the broad ligament in the neighborhood of the parovarium. Ballantyne and Williams have shown how frequently stalked cysts of the tubules of Kobelt occupy this position, and it is possible, as Bland Sutton suggests, that the pedunculated tufts of fimbriæ are simply ruptured cysts of Kobelt's tubes. Massèn states that so-called parovarian cysts may arise from these accessory tufts of fimbriæ. Tubal diverticula are sometimes met with, and it has been hazarded that their rupture, followed by the prolapse of the tubal folds through the opening thus formed, may lead to the production of an accessory ostium.

Symptoms and Diagnosis.—Supernumerary tubes, ostia, and diverticula, while having a demonstrable clinical significance, have no recognizable symptomatology. Thus, Henrotin and Herzog reported two cases in which they regarded tubal malformations as the cause of ectopic pregnancy; in one the abdomen was opened for symptoms of tubal rupture, and it was found that below the right tube was a small accessory tube with a complete ostium abdominale, and in it a sac containing blood clot, decidual cells, and chorionic villi; in the other the uterus and appendages were removed for long-continued pelvic symptoms, and it was seen that from the left Fallopian tube near its middle a diverticulum projected toward the uterus; in this there were also blood clot, decidual cells, and chorionic villi. On the other hand, an accessory ostium tubæ may render possible the occurrence of pregnancy when the normal tubal ostia on both sides of the body are closed by inflammatory adhesions, as in the remarkable case described by Sänger. Bovée reported a case in which, in an operation for adhesion of the appendages and retroversion of the uterus, examination of the right appendage showed two fimbriated tube ends. Through the upper tube a probe could be passed almost to the uterine cornu; the other was permeable to the probe for about two inches, but, as the passage of a probe all the way to the uterine from the ampullar end of a tube is rarely possible, it seemed probable that there were really two similar normal tubes in this case.

Treatment.—No treatment is called for except in cases in which anomalies have resulted in ectopic pregnancy. In such instances the defective tube is, of course, incidentally removed in the course of operation.

CONGENITAL MISPLACEMENT OF THE FALLOPIAN TUBES

Congenital misplacement of the Fallopian tubes is far from rare. It is probable that in many instances of displaced tubes, supposedly due to postnatal causes, the condition was really induced before birth. In the case of a newborn infant Ballantyne found the right Fallopian tube adherent, through fetal peritonitis, to the peritoneal aspect of the cecum, and M. L. Harris discovered, during abdominal section performed for menstrual pain, that the right tube was much longer than usual and passed to the right ovary, which lay on the *psoas magnus* as high as the bifurcation of the aorta. A case is on record by Hüter in which the tubes were displaced backward, and were united behind the uterus by their ostia, forming a ring. Another type of tubal displacement is herniation. Just as hernia of the ovary into the inguinal canal may occur, so the tube may find its way in the same direction. Usually the tube is herniated along with the ovary, but in exceptional cases it has been met with alone. Thus, Pierre Wiatt has reported the case of a six-months-old child with hydrocephalus in which the uterus was displaced toward the left side, the tube and round ligament of the same side were engaged in the abdominal opening of the inguinal canal, and the tube inside the canal was disposed in the shape of an almost complete O, the fimbriated end coming nearly into contact with the part immediately projecting from the orifice. The ovary lay near to the opening, but did not engage in it. It is probable that this form of hernia is more common than has been thought; it may be present at, or soon after, birth and be reduced by the rearrangement which takes place among the abdominal and pelvic viscera in the first year of life. If it persists it may give rise in later life to dysmenorrhea, perhaps also to sterility. The Fallopian tube may become twisted upon itself, the distal portion perishing from strangulation (Fig. 23).

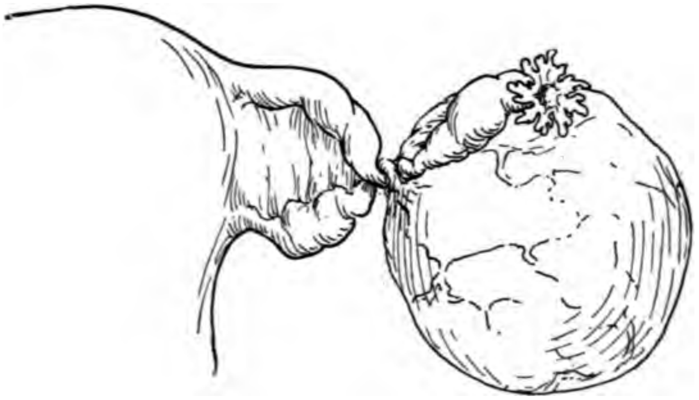


FIG. 23.—CONGENITAL OR EARLY POST-NATAL TORSION OF THE FALLOPIAN TUBE CAUSING ENLARGEMENT OF THE OVARY.

Symptoms and Diagnosis.—Displacements of the Fallopian tube, congenital or otherwise, have no definite symptomatology. When associated with adhesions or fusions, they may thereby be so anchored or angulated as to interfere with or completely inhibit their power as oviducts. If they are contained in hernial protrusions, especially if accompanied by their associated ovaries, the condition is always one of extreme painfulness. As a rule, however, the condition is not diagnosticated before operation or autopsy.

Treatment.—A displaced Fallopian tube should be replaced and held in its normal position by proper suturing of the broad ligament, possibly by similar suturing of the round ligament on the affected side. If the fimbriæ have been seriously injured, or if the tube has been seated by secondary plastic changes, the distal ostium should be carefully restored. If, however, both the displaced tube and the corresponding ovary are otherwise so diseased as to destroy their functional powers, removal of both should be practiced (see Displacement of the Ovaries).

CHAPTER V

MALFORMATIONS AND MISPLACEMENTS OF THE OVARIES

CONGENITAL MISPLACEMENTS OF THE OVARIES

Congenital misplacements of the ovaries often depend upon the fact that the ovaries, like the testicles, are developed higher up than their normal locus in postnatal life. Their descent may consequently be interrupted, and they may become fixed at some point above the pelvic cavity, or at some point within the pelvic cavity other than along the posterior margin of the broad ligaments. They are sometimes found in the femoral canal, also in the inguinal canal, which latter is at no time a pathway of normal migration. The descent along this route may extend to the labium majus, a condition that is exemplified in certain cases of pseudo-hermaphroditism.

Symptoms and Diagnosis.—Intrapelvic or intraabdominal displacements of the ovaries may be practically symptomless, or they may be the occasion of great pain, according as they are free from or subject to superimposed pressure. The pain may be even more pronounced when the ovary constitutes all or even part of a hernia that may be fixed either in the inguinal canal or the femoral canal, or in the labium majus. The pain thus induced is persistent, but increased by pressure, and is of a peculiar dull, sickening character. It is generally worse during the premenstrual period, and in certain cases is markedly recrudescent in the intermenstrual period. The pain is generally manifested in the autonomic area in the lower part of the corresponding lower quadrant of the abdominal wall. Although the ovary may be displaced, as in the hernias mentioned, the muscular rigidity thus induced is manifested over the normal locus of the organ.

Treatment.—The removal of pressure is the first essential for the relief of the great pain generally attendant upon fixed intrapelvic or intraabdominal displacement. This can generally be accomplished only by the removal of the ovary itself, a procedure ordinarily made necessary by degenerative changes that have been induced in the organ as a result of the influences to which it has been subjected. If an ovary that is hernial has either undergone degeneration or is adherent, it ought to be removed. Ovaries adherent over their entire circumferential area invariably form a tunica adventitia after their liberation, and this in turn sooner or later leads to secondary degenerative changes (see Displacements of the Ovaries).

ABSENCE OF THE OVARIES

Absence of both ovaries in a person who has a uterus and external genitalia is doubted by Ballantyne. For its demonstration it would be necessary to examine post mortem not only the pelvic cavity, but also, and with great thoroughness, the abdominal cavity as well. Its occasional occurrence in grossly deformed fetuses is, however, beyond doubt. The absence of one ovary is not so uncommon, and, when met with, is usually associated with defect of the corresponding Müllerian duct (absence of the Fallopian tube, uterus unicornis, and unilateral vagina), and sometimes with absence of the corresponding kidney. The absence of one ovary is, however, noted in cases of uterus unicornis. The author has seen two cases in which one ovary was apparently absent in the presence of normal Fallopian tubes, uterus, and ovary of the opposite side. There may have been cases of arrested descent, and the attempt to find the missing ovaries higher up was not made, as there were no indications justifying the search in operations that were undertaken for other purposes.

Symptoms and Diagnosis.—The absence of the ovaries would, of course, lead to complete amenorrhea. The absence of one ovary is symptomless, particularly in view of the fact that the remaining ovary is sufficient for ovulation, menstruation, and reproduction. The diagnosis is not made in the absence of surgical exploration which is generally undertaken for other purposes.

Treatment.—None.

RUDIMENTARY OVARIES

Rudimentary ovaries are far from uncommon. An ovary may be said to be rudimentary when it is undersized and when it either manifests no tendency to functionate or when such efforts, if manifested, are associated with inordinate pain and other constitutional disturbances. On microscopic examination, according to Ballantyne, the glands may be so ill developed and may show such an approximation in their histologic characters to the appearances seen in the earliest period in intrauterine life that it may be difficult to decide from their examination alone whether they are ovaries or testicles. In form they may resemble the fetal or infantile type, and they may be associated with the fetal, the infantile, or the bicornuate uterus. Further, they may coexist with other anomalies, such as rudimentary tubes, stenosis of the aorta, and hypoplasia of more distant organs. Rudimentary development is also often combined with congenital displacement, which is indeed itself a form of rudimentary development. If one ovary alone is in a rudimentary state the anomaly may not appreciably influence the reproductive life history of the individual in whom it exists; but, if both glands are imperfect, the menstrual flow is either entirely absent or is imperfectly established; there is defective hirsute development on the mons veneris, there is absolute sterility, and there is a condition of general infantilism, with or without chlorosis and vascular hypoplasia. Cases have, however, been put on record in which the rudimentary state of the ovaries has been associated with a normal development of the uterus and with all the signs of general bodily and mental vigor, and even with indications of sexual desire.

Causes.—Rudimentary ovaries may be due to arrested development during the embryonic period of intrauterine life, or to peritonitis during the fetal epoch, or to ovaritis from the supervention of one of the exanthemata in childhood.

Symptoms and Diagnosis.—Rudimentary ovaries are of great clinical importance. They are generally sources of extreme pain, which is worse at each menstrual period. The pain thus induced is often so great as to cause convulsive manifestations during its crescendo. A persistence of the condition through several years not infrequently results in serious neurotic manifestations. The center of pain intensity is definitely located in the ovarian autonomic area. Muscular rigidity is marked. Physical examination is best made under a quick anesthetic, such as gas-oxygen, given without a preliminary hypodermatic injection. With the patient thus thoroughly relaxed, an undersized uterus often associated with a narrow vagina will be discovered. The ovaries will generally be impalpable, and no undue force should be exerted to feel them on bimanual examination. If, now, the gas is discontinued and the pure oxygen turned on, the patient will become conscious in one minute. If the examiner has kept his examining finger in the vagina and his other hand over the abdomen, he can now exercise pressure that will enable him to determine the sensibility of the ovaries. In the presence of an undeveloped uterus and vagina with bilateral sensitiveness of the ovaries, with muscular rigidity and hyperesthesia over the ovarian autonomic areas, taken in connection with a previous history conforming to the facts already given, the presumption of rudimentary ovaries is justified.

Treatment.—The treatment of rudimentary ovaries is not one to be settled by rule of thumb, even after the diagnosis may have been confirmed by exploratory operation. The whole problem is to be solved in light of the fact that rudimentary ovaries, like a rudimentary uterus, under the stimulus of the marital relation may or may not develop to the point of functional capacity. The age of the patient, her matrimonial relations or prospects, and her desire for children are, therefore, to be taken into account, second only to the severity of the symptoms and their encroachment on the general health. The administration of anodynes necessary for the relief of pain, if long continued, will result in vicious drug habituation. Electrical and hydropathic treatments are often worse than futile. After a canvass of the entire situation, with a frank statement of all the probabilities, the surgeon should be governed by the expressed desire of the patient, or, if a minor, of her legal representatives. Under such circumstances the ovaries should be removed (see Oophorectomy).

CHAPTER VI

MALFORMATIONS OF THE URETHRA

ABSENCE OF THE URETHRA

It is doubtful if this condition has been actually observed. Cases that have been reported under this head would seem on examination to be instances of extreme hypospadias.

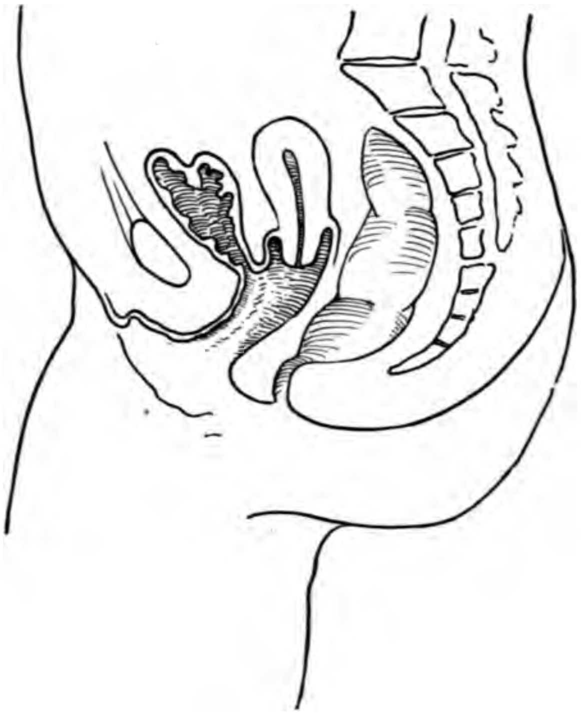


Fig. 24.—Absence of the Posterior Wall of the Urethra (Hypospadias).

HYPOSPADIAS

Hypospadias is the name given to that condition in women in which the urethra opens into the vagina at a higher level than normal (Fig. 24). Ballantyne asserts that this is really a persistence of the urogenital sinus; for what is called the lower end of the vagina in these cases is more correctly described as the urogenital sinus. It differs from persistent cloaca in the fact that the perineum and anal opening are normally formed and situated. There is a greater or less defect in the posterior wall of the urethra. The anterior wall may be present.

Symptoms and Diagnosis.—The condition may go undetected through a long life, or until accidentally observed in connection with examination for other purposes. If the orifice is high up near the bladder there may be incontinence of urine. In any event the urine is discharged into the vagina instead of externally, giving rise to tenderness and excoriations of that canal. It is also a source of annoyance on account of the dribbling spray-like character of the stream. The diagnosis is readily made by careful inspection and examination with the sound. In Kelly's case the short urethra was greatly dilated, permitting the examining finger to slip directly into the bladder.

Treatment.—The only treatment is surgical. The procedure must vary with the extent and other details of the condition in the individual case. That of Gersuny may be adopted, as was done with success by Krajewski.

9. GERSUNY PROCEDURE FOR HYPOSPADIAS

(1) The urethra is dissected out up to the neck of the bladder.
(2) The slit in its posterior wall is stitched.
(3) The canal is then twisted on its long axis and
(4) Fixed in position by a series of sutures.

The procedure that I have adopted for the restoration of the urethra after the traumatic destruction of its lower segment, and in extensive urethrovaginal fistulæ, practically an identical condition, may be adopted for hypospadias (see Injuries of the Urethra).

EPISPADIAS

Epispadias, or congenital absence of the anterior wall of the urethra, is a condition the existence of which has been questioned, except as it may occur in connection with extroversion or extrophy of the bladder. Ballantyne has described a case of this kind and gathered together thirty-two others from the literature. It consists, as in Dranitzin's case, in the absence of a greater or smaller part of the anterior wall of the urethra, with the division of the clitoris into two parts, and the presence of a median groove in the region of the anterior commissure of the vulva. There is no splitting of the symphysis pubis or anterior bladder wall.

Symptoms and Diagnosis.—Epispadias in women has only one symptom, that of incontinence of urine. The diagnosis is made by careful inspection of the parts to determine their conformity to the description just given.

Treatment.—Various plastic operations, resembling those used in hypospadias, have been employed to lengthen and narrow the urethra and to restore the anterior vulvar commissure and clitoris; but success has only been occasional. The principle involved in the author's procedure for restoration of the traumatically destroyed urethra (see Injuries of the Urethra) may be adopted with success in these cases. In that connection they should be treated on the principle that no urethra exists. The support derivable from the overlying vaginal flaps may stop the incontinence of urine—the only distressing symptom in these cases.

CHAPTER VII

MALFORMATIONS OF THE BLADDER

EXTROVERSION OF THE BLADDER

Extroversion of the bladder, variously designated as extrophy of the bladder and as ectopia vesicæ, is said by Cheyne and Burghard to occur as often as once in six thousand births. It is characterized by absence, more or less complete, of the anterior wall of the bladder, and of the abdominal wall just in front of the bladder. In certain cases there is absence of the pubic symphysis. On the other hand, there may be only a small mural defect just above the normal pubis near the base of the bladder, amounting to a suprapubic fistula.

Symptoms and Diagnosis.—The symptoms vary according to the extent of the defect. When there is complete absence of the anterior wall or walls of the bladder, its posterior wall protrudes above the level of the anterior wall of the abdomen. This protrusion is soft, spongy, resonant, and crepitant, being, in fact, a true hernia with the intestines lying just underneath. The appearance of the mucous membrane of the extroverted posterior wall of the uterus is red and fleshy, with a tendency to small hemorrhages at various points, especially in excoriated areas that are nearly always present. The urine undergoes ammoniacal decomposition, thus becoming irritating and offensive. The ureteral orifices are generally in plain view, their identity being easily established by the intermittent jet-like discharge of urine.

Treatment.—*Medical.*—The distressing character of this condition makes some attempt at relief simply imperative. The wearing of absorbents to take up the urine, or of some kind of India rubber device to keep it from running over and irritating the whole abdominal wall, is generally unsatisfactory. Operative interference should, however, be deferred, if possible, until the age of the patient is some guarantee of resistance to surgical shock. In the meantime care must be taken to keep the extroverted area as free as possible from infection, which is liable to extend up the ureters to the bladder, thus inducing serious and sometimes fatal complications. The persistent irritation of the surrounding integument calls for careful attention. Stearate of zinc gently

CHAPTER V

MALFORMATIONS AND MISPLACEMENTS OF THE OVARIES

CONGENITAL MISPLACEMENTS OF THE OVARIES

Congenital misplacements of the ovaries often depend upon the fact that the ovaries, like the testicles, are developed higher up than their normal locus in postnatal life. Their descent may consequently be interrupted, and they may become fixed at some point above the pelvic cavity, or at some point within the pelvic cavity other than along the posterior margin of the broad ligaments. They are sometimes found in the femoral canal, also in the inguinal canal, which latter is at no time a pathway of normal migration. The descent along this route may extend to the labium majus, a condition that is exemplified in certain cases of pseudo-hermaphroditism.

Symptoms and Diagnosis.—Intrapelvic or intraabdominal displacements of the ovaries may be practically symptomless, or they may be the occasion of great pain, according as they are free from or subject to superimposed pressure. The pain may be even more pronounced when the ovary constitutes all or even part of a hernia that may be fixed either in the inguinal canal or the femoral canal, or in the labium majus. The pain thus induced is persistent, but increased by pressure, and is of a peculiar dull, sickening character. It is generally worse during the premenstrual period, and in certain cases is markedly recrudescent in the intermenstrual period. The pain is generally manifested in the autonomic area in the lower part of the corresponding lower quadrant of the abdominal wall. Although the ovary may be displaced, as in the hernias mentioned, the muscular rigidity thus induced is manifested over the normal locus of the organ.

Treatment.—The removal of pressure is the first essential for the relief of the great pain generally attendant upon fixed intrapelvic or intraabdominal displacement. This can generally be accomplished only by the removal of the ovary itself, a procedure ordinarily made necessary by degenerative changes that have been induced in the organ as a result of the influences to which it has been subjected. If an ovary that is hernial has either undergone degeneration or is adherent, it

Tiersch seeks to avoid this complication by (a) dissecting loose the desired flap by incision at each side of it, but leaving it attached at either end; (b) a piece of sterile gauze is slipped under the flap thus raised, and is kept there for several days, or long enough for granulations to spring up on its under surface (Fig. 25). (c) One end is then cut loose, turned into place, and fixed by suture (Fig. 26). (d) If this does not accomplish the desired purpose another flap is secured by the same method from the other side of the extroverted area (Fig. 27). (e) If a third flap is required it may be secured in the same way. (f) If epispadias exists it is dealt with after the bladder conditions have been brought under control. This procedure is available for subjects of any age.

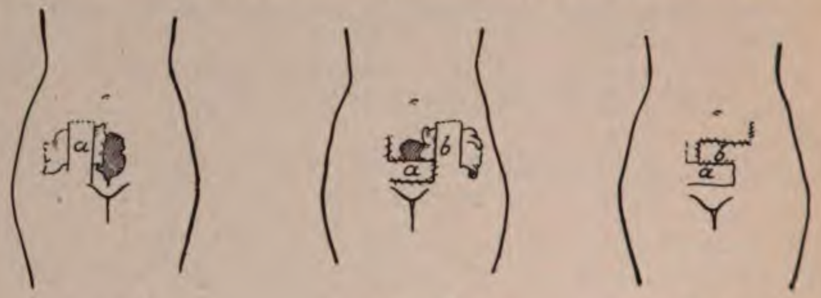


FIG. 25. FIG. 26. FIG. 27.

FIGS. 25–27.—(11) TIERSCH PROCEDURE FOR EXTROVERSION OF THE BLADDER (after Cheyne and Burghard).

FIG. 25.—(a) First flap (*a*) shaped but not completely detached.

FIG. 26.—(b) The first flap (*a*) loosened and turned into place and the second flap (*b*) shaped but not completely detached.

FIG. 27.—(c) Both flaps (*a* and *b*) turned into place after granulations have formed on their under surface. The epispadias remains to be corrected.

12. MAYDL PROCEDURE FOR TRANSPLANTING THE URETERS IN EXTROVERSION OF THE BLADDER

Maydl's method of transplanting the ureters in extroversion of the bladder is, however, so specifically related to the condition that it deserves special consideration. It is carried out as follows, viz.:

(1) The exposed mucous membrane of the extroverted bladder is carefully excised, leaving only an oval disc surrounding the two orifices of the ureters (Fig. 28).

(2) The whole field of operation is cleansed, care being taken to sterilize the mucous disc as thoroughly as practicable.

(3) The abdominal cavity is opened along the left side of the denuded area.

(4) A loop of sigmoid is brought up, stripped of its contents, and a heavy thread or tape tied around it above and below the proposed site of implantation.

(5) The mucous disc is then liberated by dissecting up both ureters far enough to permit the disc to be turned in.

(6) An opening long enough to accommodate the disc is then made in the sigmoid between the tapes.

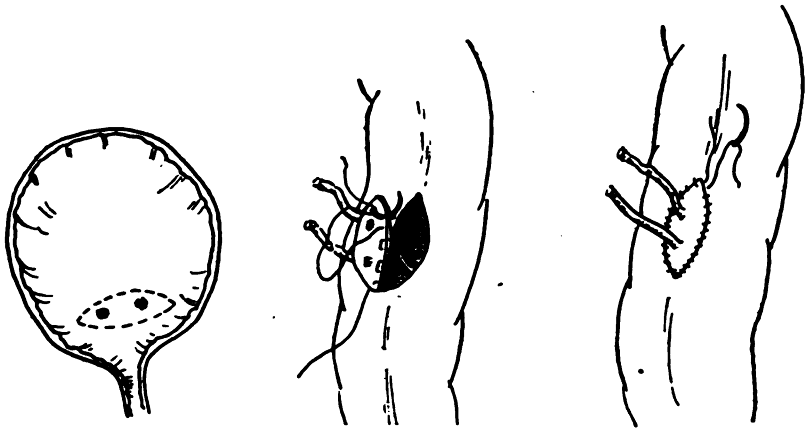


FIG. 28. FIG. 29. FIG. 30.

FIGS. 28–30.—(12) MAYDL PROCEDURE FOR URETERO-INTESTINAL IMPLANTATION IN EXTROVERSION OF THE BLADDER (after Binnie).

FIG. 28.—(a) Dotted line showing area of mucous membrane to be left attached to ureters, the orifices of which are indicated.

FIG. 29.—(b) Preliminary step in the implantation of the disc of vesical mucous membrane with ureteral orifices into the sigmoid.

FIG. 30.—(c) Disc of vesical mucous membrane with ureters finally implanted in the sigmoid.

(7) The disc is then implanted by a double row of sutures, the first or inner row (Fig. 29) being continuous, of fine silk or linen, the outer or peritoneal row (Fig. 30) being interrupted, of fine slow-absorbing catgut.

The great advantages of this operation are: (1) the relative simplicity of its technique; (2) the preservation of the normal valvular orifices of the ureters—an important barrier against ascending infection; (3) as compared with plastic procedures, it secures continence of urine; (4) the rectal outlet for the urine is a safeguard against the formation of calculi.

Compensatory operation contemplates the diversion of the urinary current into the intestinal tract, and is accomplished by transplantation of the ureters (see Injuries of the Ureters).

PATULOUS URACHUS

The urachus is a survival of the allantoic vesicle from which are derived the urethra and bladder. As found in postnatal life it is a cord-like remnant of fetal structure, extending from near the fundus of the bladder to the umbilicus. It is recognizable in practically every subject.

This rudimentary canal consists of three layers: (a) an inner epithelial layer; (b) a middle basement membrane; and (c) an outer fibrous layer. The epithelial layer consists of a variety of cells, corresponding in form and size to those found in various parts of the urinary apparatus. They are either ovoid or polygonal, and are generally nucleated. The intermediate layer of basement membrane is described by Luschka as being structureless, delicate, and transparent. The outer or fibrous layer, while attached to the outer side of the basement membrane, is distinctly separated from the surrounding cellular tissue. It will be seen, therefore, that, while this structure exists as a blind and ordinarily functionless canal, it possesses all the histological elements to render it a highway of communication. Luschka declares that in the majority of male subjects this canal is found to be partially opened, and goes to the extent of stating that it possesses a mucous membrane. If this is true, as it may be in certain instances, the necessity for its patulousness becomes apparent.

Clinically the urachus is found open (a) at both ends and (b) at its cystic end. When open at both ends the condition is spoken of as congenital vesicoabdominal fistula.

Symptoms and Diagnosis.—When urine escapes from the navel this condition may be premised. A flexible sound can generally be passed without difficulty from the navel orifice into the bladder. The bladder in such cases can be catheterized by this route. While in the majority of cases this condition is congenital, there are instances on record in which an opening has been forced through the urachus by retention of urine. Atresia of the urethra, due to gonorrhea, prostatic enlargement, and phimosis have been recorded as direct exciting causes and should be taken into account in making a diagnosis.

Treatment.—This is exclusively surgical and consists in removing the urachus by abdominal section. No part of the urachus should be left, as the remaining portion has a tendency to develop into a cyst.

13. PROCEDURE FOR REMOVAL OF PATULOUS URACHUS

(1) A median incision should be made from the umbilicus to near the pubis.

(2) The canal is then dissected out.

(3) Its lower (vesical) extremity is ligated.

(4) As a precaution against the extravasation of urine into the peritoneal cavity, it is well to fix the pedicle of the urachus in the lower angle of the abdominal incision.

Before undertaking the operation it is well to observe the admonition of Douglas by making sure that the caliber of the urethra is sufficient to enable the urine to escape.

CHAPTER VIII

MALFORMATIONS OF THE URETERS

The chief malformations of the ureters are duplication and stricture.

Duplication of the Ureters.—Duplication of the ureter is the most common anomaly of that canal. This condition may occur unilaterally or bilaterally. The second ureter may extend from the kidney to the bladder, opening into this organ usually a little above the normal opening, or the supernumerary ureter may join its fellow at any point along its course. It may terminate at the bladder in a blind tube which, as it becomes distended with urine, may project into the bladder as a cystic pouch. This pouch may even obstruct the opening of the normal ureter and thus give rise to a nephrydrosis. The ureters may open abnormally into the bladder, both ureters opening on the same side. A ureter may open near the internal orifice of the urethra or even into the urethra or the vestibule alongside of the meatus urinarius. In the latter two cases permanent incontinence of urine will be present, as the urine will escape continuously from the open ureter, and a surgical operation, having for its object the implantation of the ureter into the bladder, will be necessary to correct the condition.

Stricture of the Ureter.—Stricture of the ureter may result from cicatricial contraction following internal trauma due to the passage of a stone; to laceration from overstretching of the body, and to injury from external violence. The contraction leads to dilatation of the ureter (hydroureter) above the seat of the obstruction and to the development of a nephrocystosis (q. v.).

The latter condition usually first directs attention to the possibility of a stricture, which may then, at times, be located by means of the ureteral bougie. Attempts have been made, and with some success, to dilate ureteral strictures by passing bougies as in urethral strictures. Should this not succeed an operation may be necessary. The ureter may be reached through an extended oblique incision, the peritoneum being raised up and carried inward. The stricture, if it is a narrow one, may be divided longitudinally and stitched transversely after the manner of the Heineke-Mikulicz operation on the pylorus (Fenger);

or the stricture may be resected, the upper end of the lower portion of the ureter ligated, a small slit made in the canal just below the ligature, and the lower end of the upper portion, which has been slit up slightly, invaginated into the lower portion through the slit in the side and retained by fine catgut stitches (Van Hook).

CHAPTER IX

MALFORMATIONS OF THE KIDNEY

Anomalies of the kidneys may be considered under three heads: (a) anomalies of number; (b) anomalies of location; (c) anomalies of form.

Anomalies of Number.—Absence of both kidneys has been observed, but the condition is incompatible with prolonged postnatal existence.

Absence of one kidney, provided the other is normal, is perfectly compatible with health and existence to old age. This condition is found in one individual in about 3,000, and is thus of considerable surgical importance. The remaining kidney is called a "single" or "solitary" kidney.

Ballowitz[1] has collected 213 cases of "single" kidney. The left kidney was absent 70 times and the right 42 times in males; the left 31 times and the right 34 times in females; remainder unstated. While in men the absence of the left kidney distinctly predominates, in women the two sides are about equally represented.

With absence of a kidney is frequently found some developmental defect in the generative organs of the same side, such as absence of the ovary and tube and uterus unicornis in women, or absence of the seminal vesicle, *vas deferens,* or testicle, or unilateral prostate, in men. In 71 women such defect was found 41 times, while in 113 men it appeared only 28 times. A "single" kidney is almost always larger than normal. In 116 cases the kidney was distinctly hypertrophied, while in only 5 cases it was found smaller than normal. Nephrydrosis, chronic inflammatory or other pathological changes were found in nearly 12 per cent. of Ballowitz's 213 cases. "Single" kidney has been unwittingly removed a number of times for disease, with the inevitable death of the patient as a result. In all cases, therefore, in which nephrectomy is contemplated the possibility of "single" kidney must first be excluded. In "single" kidney almost always but one ureter is found opening into the bladder, and this is of great diagnostic importance, but in 4 cases 2 ureters were found opening into the bladder at their normal locations, the one leading to the kidney, the other forming only a shorter or longer blind tube. "Single" kidney usually occupies the normal location on one or the other side, but may be displaced, as described under Anomalies of Location.

---

[1] *Archiv. für pathologische Anatomie,* Bd. cxli.

A few cases have been described in which three kidneys were said to be present. Most of them were probably cases in which one kidney had become subdivided into two portions by a deep furrow extending entirely through it, the two portions becoming somewhat displaced from each other, and the ureter from each soon uniting to form a common ureter. Cheyne, however, describes a case of a woman on whom he operated for a movable tumor situated to the right of the middle line. Upon opening the abdomen the tumor was found to be a movable third kidney with its own ureter and blood supply. It lay near the pelvic brim from 3 to 4 inches from the normal right kidney, which was present. A left kidney, somewhat smaller than normal, was present in the usual location.

Anomalies of Location.—The kidney may occupy any position from the normal above to within the pelvis below. Both kidneys may occupy the same side of the body, lying one above the other. The ureter of the misplaced kidney usually crosses over to its proper side, where it enters the bladder at the normal place. The most common misplacement is at or near the brim of the pelvis, over the sacroiliac joint, or just within the pelvis. Of 76 collected cases of pelvic misplacement the right kidney was misplaced 12 times and the left 64 times. The ureter is shorter than normal, according to the degree of misplacement, but enters the bladder at the usual point. The blood supply is derived from the aorta near its point of bifurcation, or from one or the other iliac arteries. The kidney is usually fixed and somewhat flattened from before backward. When in the pelvis the kidney may be the cause of dystocia by preventing the engagement of the head. In such a case Cragin did a vaginal nephrectomy under the supposition that it was a tumor causing the dystocia. Goulliund operated on a pelvic kidney under the mistaken diagnosis of interstitial salpingitis. Misplaced kidneys may be the seat of pathologic changes.

Dartigues operated on what he supposed to be a cyst of the mesentery, but found a case of nephropyosis in a kidney misplaced in the mesentery of the small intestine. Such cases have only been diagnosticated at or after the operation, but in all cases of unusual tumors in the pelvis or about the pelvic brim the possibility of a misplaced kidney should be considered. In misplaced kidney the adrenal does not usually accompany the kidney, but remains in its normal location.

Anomalies of Form.—The kidney may retain its fetal lobulated form, deep fissures, often extending to the pelvis, separating the lobules.

The most important anomaly of form is the "fused" kidney. In this condition the two organs are united, the degree of union or fusion varying from the simple horseshoe kidney to almost complete fusion into one organ. In the variety called "horseshoe" kidney the two organs lie one on either side of the vertebræ, their lower poles being connected by a band of tissue called the isthmus, which extends across the vertebræ in front of the aorta and vena cava. The isthmus may be composed simply of a band of connective tissue, or it may contain kidney tissue. It may be quite long, or the lower poles may be fused directly together, in which latter case a connective tissue septum usually separates the kidney elements belonging to one organ from those belonging to the other. The pelves are usually directed more anteriorly than normally, and the ureters pass in front of the isthmus. Rarely the isthmus extends between the upper poles instead of the lower.

The fused organs may both lie on the same side of the body, in which case the lower of the two is the misplaced organ. The lower pole of one fuses with the upper pole of the other, with the pelves looking in opposite directions or in the same direction. Almost all degrees of fusion may take place, but the pelves usually remain completely separate and distinct, each having its own pyramids and tubules supplying it, and each having its own ureter. One-half of a fused organ may be the seat of pathologic changes, while the other half remains normal, a fact of considerable surgical importance. Abnormalities in the blood supply are almost always present. Fusion does not appear to predispose to disease. According to McMurrick, 40 per cent. of the fused organs were on the right side and 60 per cent. on the left; 78 per cent. occurred in men and 22 per cent. in women.

Under the anomalies of form may be mentioned the "suppressed" or congenitally small kidney. In this case the kidney has been arrested in its growth, so that often but a remnant of the organ is found. A "suppressed" kidney may secrete urine of normal composition, but in quantity insufficient to maintain life, should the opposite organ require removal.

CHAPTER X

MALFORMATIONS OF THE RECTUM

ABSENCE, ATRESIA, AND STENOSIS OF THE ANUS

There are rare instances in which there has been no manifest embryonal impulse to develop an anus. There is no umbilication at the usual point of formation, and microscopic examination fails to reveal either a rudimentary rectum or a sphincter muscle (Fig. 31). In other instances there is simply an occlusion of the otherwise normally formed anus (atresia) (Fig. 32). In a third class of cases there is an anal opening too narrow to discharge the duties of such an orifice (stenosis)

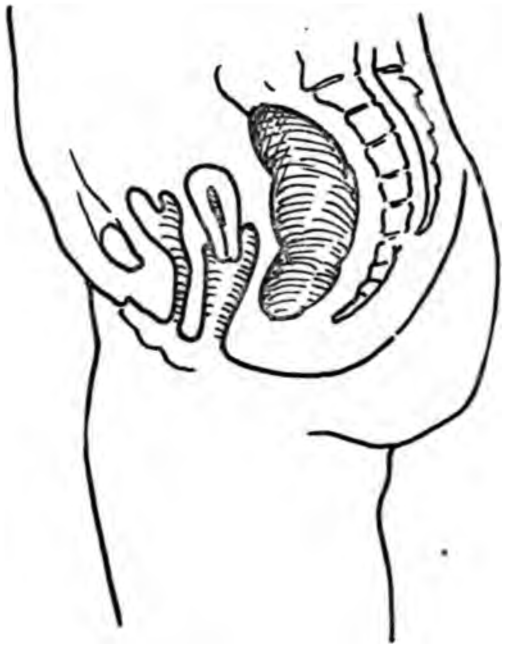


FIG. 31.—ABSENCE OF ANUS.

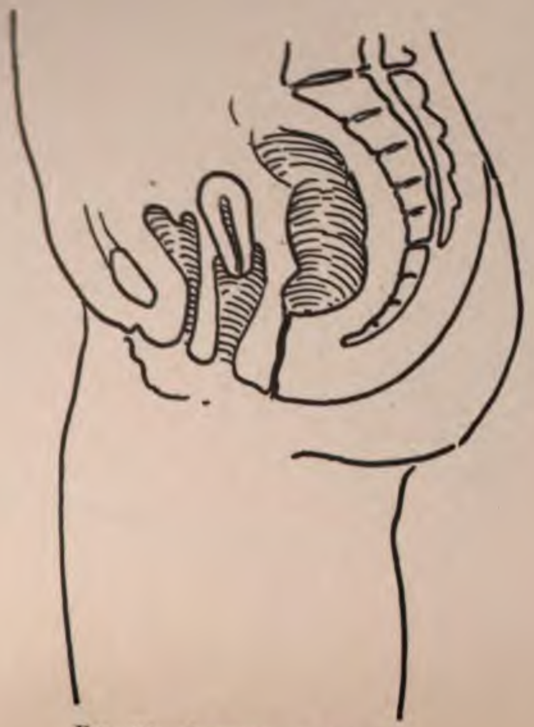


FIG. 32.—ATRESIA OF ANUS.

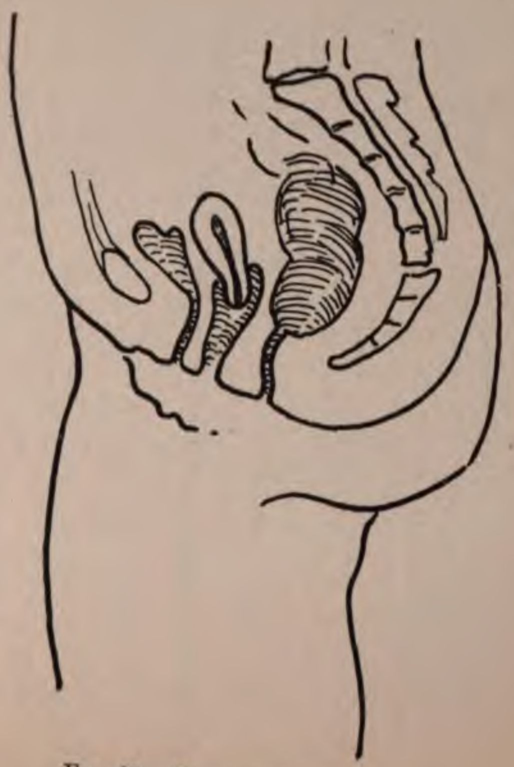


FIG. 33.—STENOSIS OF ANUS.

(Fig. 33). The zone of occlusion and that of narrowing may be respectively either very short or may involve the lower third of the rectum.

Symptoms and Diagnosis.—The failure of the newly born child to discharge meconium from the rectum will attract attention to occlusion; if the discharge is scant, much less than it ought to be, or if the meconium appears in only drop-like exudations, examination may reveal a pin-hole anus (stenosis). If, in a case of occlusion, a slight pouching at the anal site appears after the lapse of several hours or days, the occlusion may be recognized as membranous in character; if no such protrusion appears, but if umbilication at the anal site exists, the case may be accepted as one of more extensive atresia; if there is neither umbilication nor pouching, it is probable that the lower third of the rectum is absent.

Treatment.—The orifice of a pin-hole anus may be successfully divulsed by introducing and then opening a narrow, pointed hemostatic forceps. This may be repeated one or more times if necessary. In the case of a bulging atresia a slight puncture in the center of the sac, followed by divulsion with the forceps, may be all that will be required.

14. PROCEDURE FOR EXTENSIVE STENOSIS OF THE RECTUM

(1) A slight puncture should be made in the center and at the bottom of the anal depression.

(2) A small probe should then be insinuated into the end of the cord-like structure representing the rudimentary rectum.

(3) This should be carried up until the meconium is reached.

(4) A larger probe and, finally, the slender tips of a hemostatic forceps should be introduced, the latter being used for slight divulsion.

(5) If no rudimentary rectum is found under the integument the probe should be forced in the direction of the rectal pouch.

(6) When it is reached the condition should be treated as in extensive atresia.

(7) In both instances the small nozzle of a syringe, or other larger but similarly shaped body, should be worn as an obturator, until healing is completed.

If the rectum cannot be reached by these means the advisability of a colostomy is to be taken under consideration.

VULVAR ANUS

Anus of the vulva is designated by Ballantyne as persistent cloaca. In this condition there is no anal orifice and the feces pass through the vagina. Examination reveals an opening which may be pin-hole in size in the neighborhood of the hymen, or at slightly higher level in the vagina; this is the lower end of the rectum (Fig. 34). Sometimes there are two vulvar openings between the posterior commissure and the hymen, and a dimple where the normal anus should have been. In some cases there is complete absence of the rectovaginal septus. Sometimes, but rarely, the anomaly coexists with a normal anal opening. It is noteworthy that in quite a number of the reported cases there was control over the motions. Under such circumstances the malformation might pass unrecognized till after marriage or the occurrence of labor. When the atresia of the vulva is associated with hypertrophy of the clitoris doubts as to the sex of the individual may arise.

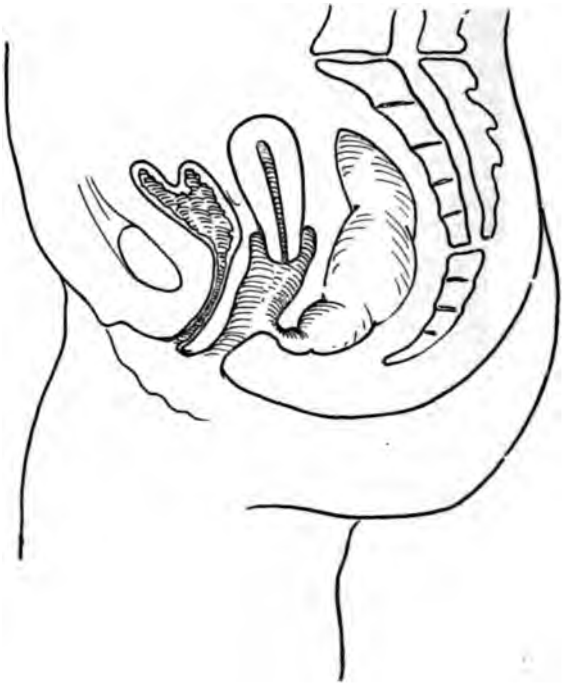


FIG. 34.—VULVAR ANUS, SHOWING ABSENCE OF TRUE ANUS AND RECTUM COMMUNICATING WITH THE VAGINA.

Symptoms and Diagnosis.—The symptom that first attracts attention is the passage of the meconium through the vulvar orifice. Inspection then reveals the absence of the anus.

Treatment.—If the meconial and later fecal discharges from the vulva are sufficiently free, no treatment should be undertaken during early infantile life. If, by mechanical appliances or otherwise, the fecal incontinence can be brought sufficiently under control for approximate comfort, surgical interference may well be left until puberty or later. The procedure must then vary somewhat according to the conditions in the individual case.

15. PROCEDURE FOR TREATMENT OF VULVAR ANUS

(1) When the opening into the vagina is just above the perineum the latter structure should be divided down to what ought to be the anal site.

(2) The mucous membrane of the rectum should then be brought down and united posteriorly to the newly formed skin margins by a few interrupted silkworm gut sutures.

(3) The remainder of the procedure should define the technique of the operation for complete laceration of the vagina (q. v.).

(4) If the sphincter ani is absent the levator ani should be isolated and a few striæ transposed and implanted around the lower part of the rectum, a half inch above its cutaneous fixation.

ANOMALOUS ANUS

Anomalous anus may with propriety embrace vulvar anus, which, for convenience, has been considered as a separate variety. It is true, however, that in the presence of imperforate anus compensatory openings may occur in other localities. These have been observed in the urethra, scrotum, and base of the penis in the male, and in the bladder, gluteal, lumbar, and sacral regions of both sexes. The condition is generally spoken of as congenital fecal fistula.

Symptoms and Diagnosis.—The discharge of fecal matter through an adventitious opening, especially in the presence of an imperforate anus, is the one essential diagnostic sign.

Treatment.—The treatment must vary according to the age of the patient and the location of the opening. If the fecal outlet is ample there ought to be no interference in the early period of life. In later years the condition can be corrected with more safety to the patient. Generally two operations are necessary. The first should be addressed to the establishment, if possible, of a normal anus. After this has been accomplished the adventitious fecal opening may close spontaneously. If it fails to do so, after the lapse of sufficient time, it should be done by operation. The details of both operations must be devised to meet the details of the condition presented by each case.

CHAPTER XI

MALFORMATIONS OF THE BREAST

ABSENCE AND RUDIMENTARY DEVELOPMENT OF THE MAMMARY GLANDS

The mammary glands are sometimes absent in women. When this anomaly occurs it generally involves both sides. When the absence is complete there is no nipple. In other cases the glands and nipples are very rudimentary, and fail to respond to the developmental impulse of puberty.

Symptoms and Diagnosis.—The diagnosis cannot be made until after puberty; generally not until after pregnancy. Although no nipple may be apparent, there are instances of rudimentary breast in which the nipple was concealed under the skin until after pubescent development of the gland had taken place. A rudimentary gland, susceptible of further development, may be so hidden in adipose tissue as to defy detection.

Treatment.—There is no treatment for demonstrably absent mammæ. When the glands are rudimentary they are often developed at puberty, or later by pregnancy. If they do not respond to puberty they should be subjected to treatment by judicious massage or by pneumatic suction. This latter is accomplished by applying a bell-shaped vessel over and around the breast and then exhausting the air. An old-fashioned "cup"—i. e., a bowl—with a few drops of ignited alcohol in the bottom of it should be suddenly inverted over the breast and tightly adjusted to the skin. The flame is at once extinguished, the air is exhausted, and the breast is drawn into the cavity. The congestion thus mechanically induced, if repeated at frequent intervals, will result in marked development. If carefully done no danger from burning will be incurred.

SUPERNUMERARY BREASTS

There are rare instances of supernumerary or accessory mammary glands, which may be located anywhere on the chest or abdomen except in their normal positions. To be true accessory glands they must be capable of secreting milk. The aberrant mamma of Luschka has an independent opening of its own, generally in the axilla, and has no connection whatever with the normal breast and nipple, which may be, and generally are, fully developed. Other varieties of supernumerary breasts often communicate with the milk ducts of the otherwise normal breast.

Symptoms and Diagnosis.—A supernumerary or accessory breast communicating with a normal gland and nipple may easily be mistaken for a neoplasm. Its existence from birth, its development at puberty, its turgescence at menstruation, its evolution during pregnancy, and its involution following establish its identity. An aberrant mamma of Luschka is known by its complete development, including the nipple and its orifices—a complete, but misplaced, breast. It presents the same morphologic and functional history as the preceding, with the difference that it is susceptible of independent lactation.

Treatment.—These atypical glands, when otherwise normal, call for no treatment whatever, unless by their location and size they seriously interfere with the comfort of the patient. They can then be readily removed. If they become the seats of infection, hypertrophy, cysts, neoplasms, or cancer, they should be treated precisely like typical mammæ under similar conditions.

SECTION II

INJURIES

CHAPTER I

INJURIES OF THE VULVA

Injuries of the vulva and perineum occur for the most part as incidents of parturition, and might, therefore, be considered with propriety under the division on Surgical Conditions of Pregnancy and Parturition (*q. v.*). The fact, however, that there are many examples of strictly traumatic injury of these structures, and the additional fact that injuries of parturient origin generally receive surgical attention in the strictly post-parturient period, will justify some departure from the strict classification.

LACERATIONS OF THE VULVA

Lacerations of the vulva are not infrequent among young girls. They occur for the most part from traumatism as the result of falls astride of some hard or pointed object, such as limbs of trees or the rails or palings of fences. Instances are on record in which foreign bodies have been driven far up into the pelvis, doing injury to the deeper viscera (see Foreign Bodies). Attempts at rape are also causes of serious vulvar injuries, particularly those involving the perineum.

INJURIES DUE TO RAPE

Injuries due to rape, or to attempted rape, are not only of surgical importance, but of so much medicolegal importance that they require special consideration. The gynecologist is often called, and some general practitioner is practically always called in these cases to determine whether or not there are physical signs of criminal assault.

The physical evidences of rape, or of attempted rape, have been summarized by Wyatt Johnston as follows, viz.: (a) Local injuries to the genitals; (b) injuries elsewhere, due to struggle, or possibly to sadism; (c) signs of seminal or blood stains on the clothing, tearing, etc. As the subjective evidence mainly rests on the uncorroborated testimony of the victim, the medical examination should include matters which indirectly corroborate or contradict her statements. There is no crime which becomes oftener the subject of groundless charges made for purposes of blackmail or revenge. We will consider here those points which call specially for observation from the gynecological point of view.

Symptoms and Diagnosis of Rape.—Local injuries to the female genitalia, due to rape, can hardly be called characteristic unless the subject is very young, or unless great violence has been exerted. Laceration of the hymen, contusions or abrasions of the vulva, hemorrhage, evidence of injury corresponding in apparent recentness to the time of alleged assault, venereal infections—both gonorrhea and syphilis—and, in exceptional instances, lacerations of the vagina, perineum, rectum, or bladder are indicative of rape.

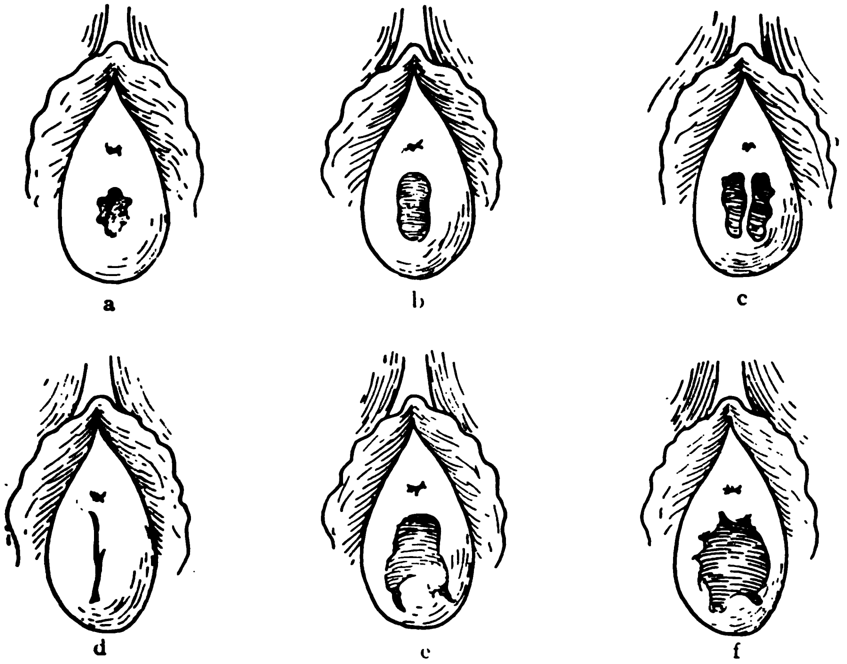


Fig. 35.—Types of Hymen. (a) Annular hymen; (b) semilunar hymen; (c) septate hymen; (d) vertical hymen; (e) normal injury after coitus; (f) carunculae myrtiformes (after Williams).

In taking these various injuries into account it is of the highest importance to avoid all error that can possibly be excluded. Thus, what may be taken for a ragged or otherwise mutilated hymen may, in fact, be but one of several normal forms of that structure. For the guidance of the examining surgeon outline drawings of the leading recognized normal forms of the hymen are given (Fig. 35). The parts should be carefully inspected, as there is danger of confusing ulcers with lacerations, or of mistaking old lacerations for recent ones. The examination should be made most carefully with the aid of an assistant and in a good light, the finger being passed round behind the hymen so as to bring it into relief. Whitish scars denote lesions previously existing. Granulating wounds and erosions show that the injuries have existed several days, probably a week, if they are in process of healing. The recent defloration of the virgin hymen is usually accompanied with a considerable amount of swelling, redness, and pain. Intromission and ejaculation may, however, occur without rupture of the hymen, and, owing to the increased frequency of local gynecological treatment in young unmarried women, the hymen is liable to have been previously interfered with. A typical ruptured hymen is the exception, rather than the rule, in most cases of rape.

Full objective proof is only forthcoming in a small proportion of all cases. The relative proportion of the genital organs in the victim and the accused must be considered in order to give a definite answer in individual cases.

During the healing stage there is little that is characteristic in the lesions.

Hemorrhage from forced coition may be absent, slight, or extensive, according to the relative size of the organs, the force employed, the age and consequent resistance of the female structures. It is always an important sign, and blood-stained clothing should be carefully guarded.

Contusions of the vulva due to rape are generally ecchymotic, and lacerations are ordinarily irregular, with a tendency to be confined to the fourchette and perineum. If such injuries are recent they will usually be accepted as positive proof of penetration. Absence of such injuries does not exclude the possibility of penetration.

Infection of the female genitalia with either the *B. gonococcus* (gonorrhea) or with the *Spirochæta pallida* (syphilis), while strongly presumptive from clinical signs and history, can be established only by the microscopic demonstration of the respective organisms. If a similar demonstration can be made from the genitalia of the accused, an important link in the evidence will have been established.

Pregnancy following criminal assault is not frequent, although it may occur. The relation of the dates of viability and parturition to that of the alleged assault is of importance in this connection.

Seminal stains upon the clothing and seminal deposits upon the body should be looked for with great care. The well-known straight outlined stiffening of the stains is striking. The skin of the abdomen and thigh should be searched for traces of the seminal crust. In the case of seminal stains the Florence reaction is invaluable as a prompt preliminary test. A drop of the Florence solution (composed of iodin, 2.5 parts; potassium iodid, 1.5 parts; and water, 30 parts) is brought into contact with moistened filaments from fabrics containing semen observed beneath the microscope. An abundant formation of the fine brown needle-shaped crystals instantly occurs. The sensitiveness is decidedly lessened in the presence of urine, and is greater in cold than warm solutions. If positive results are thus obtained spermatozoa should be searched for cautiously by moistening the fabric by imbibition, scraping the surface, and dissociating the fibers. The best results are obtained by making a culture film or cover-glass preparation and staining with eosin and methyl green, which gives a double staining of the head of the spermatozoa. The specimen may then be mounted in balsam and examined under a one-twelfth-inch immersion lens. Unstained specimens examined with the ordinary dry lenses are much less characteristic. It should be remembered in this connection that, while the spermatozoa are less numerous in old stains, age does not impair the Florence reaction. To preserve suspicious stains cut out the suspected portion of the material and place it between flat pieces of cardboard during transmission to the laboratory. The fallacies of the Florence reaction as a final test are that lecithin and certain decomposition products give similar precipitates, but this in no wise impairs its utility as a preliminary test. Failure to give the reaction does not prove the stain to be non-seminal, but makes it unlikely that positive microscopic results will be obtained.

The possibility of azoöspermia must be borne in mind. Stains from vaginal or nasal mucus or pus can sometimes be recognized microscopically by the cellular element.

It is of the highest importance to search for and take into account injuries to other than the genital parts. The author was recently called into a case in which the sacroiliac articulation on one side had been wrenched apart in the violence of an effort to separate the thighs of the victim. Finger prints, scratches, and bruises of the abdomen, pubes, and thighs, as well as of the chest, limbs, and face, with or without tearing of the clothing, should be regarded as evidence.

The absence of these tends to throw a doubt upon the allegations of rape, unless there was more than one assailant, or the use of narcotics, intoxicants, or anesthetics is alleged. The vexed question of the possibility of rape during natural sleep has little practical bearing upon the ordinary class of cases. Surprise and terror may, of course, lessen the power of resistance. Conditions suggestive of sadism should lead to a very careful examination into the mental state of the accused.

Treatment.—Injuries should be treated in accordance with their individual indications.

INDECENT ASSAULT

Indecent assault implies the forced, libidinous manipulation of the female genitalia without effort at sexual intercourse.

Symptoms and Diagnosis.—In a large proportion of cases the victim is a little girl under ten years. The attempt is most often made with the finger. As a rule, the signs of a struggle are absent, and on this account the establishment of direct proof is often impossible. The local evidences are usually slight inflammation and reddening with or without laceration of the hymen. A slight discharge often follows. The method of examination is the same as in cases of rape.

In such cases care must be taken to exclude local conditions, which frequently cause spontaneous vulvovaginitis in children. The presence of the gonococcus is significant, but the possibility of infection from other children or from members of the family must be borne in mind.

Evidences of masturbation, such as an elongated or turgescent clitoris with pigmented labia, should be looked for. The pigmentation is usually unilateral. It must be borne in mind that children are naturally mendacious, and may either originate a story of assault themselves or accept one suggested to them by their parents, or by leading questions put to them by their parents, or by leading questions put to them in the course of the medical examination. Fournier's classical advice to medical men charged with the investigation of these cases, that one should close his ears and open his eyes, is to be kept constantly in mind. Another excellent rule is to refuse to give a medical certificate to be used by the friends of the plaintiff as the basis of the case.

PUDENDAL HEMATOCELE

Pudendal hematocele implies a circumscribed accumulation of blood in the pudendal structures. The deposit of blood may be small, or it may be very large, that in one case reported by Cazeaux being so extensive that it ploughed up the abdominal wall of the right side to the costal margin. It may be the result of a blow, a kick, or a fall; or, in the pregnant state, of varices preceding labor, the pressure of the descending head, or the unskillful use of forceps.

Occasionally the rupture occurs in the wall of the vagina, and only reaches the vulva by an extension of the accumulation, while in other cases the hematoma is confined to the vaginal wall. Sometimes the distention becomes so great that the skin or mucous membrane gives way and the blood clot escapes. If the hematocele is the result of rupture of an artery the hemorrhage resulting from the breaking down of the skin may become active, even after the clot has been *in situ* for a number of days. In small accumulations the clot may be absorbed; in others, where the pressure under and against the integument is very great, or where the contusion has been extensive and severe, gangrene may result. In occasional cases the clot may become solidified, even to the extent of calcification.

Symptoms and Diagnosis.—The symptoms of pudendal hematocele consist of swelling of the labia, with pain in the parts which, even in the midst of the pains of labor, is generally sufficiently severe to attract the attention of the patient. The tumor increases rapidly in size, and at first is usually without any change of color in the skin, but later becomes pinkish and bluish, and, finally, when absorption is well under way, it becomes brown or bronzed in appearance. This tumor is generally at first very tense, but later, as absorption or suppuration takes place, becomes softer and more fluctuating. Its formation may be attended with some shock, corresponding in degree to the severity of the causative injury, the amount of the extravasated blood, and to the rapidity with which such extravasation takes place.

Treatment.—The treatment should be such as never to permit the development of hematocele to anything like the extreme degree indicated by the preceding description, which, needless to say, is based upon the natural history of these cases in what may be called the presurgical period. The treatment should, however, vary a little, according as the hematocele is the result of external violence or of parturition, and according to the size of the clot. If external violence is the cause, and if the clot is large and has developed, or is developing, with rapidity, there is strong probability that it is being fed by a severed artery, under which circumstances the patient should be anesthetized and the bleeding points found and ligated. If, however, the clot has formed slowly and is not large, it should be treated with rest and the application of ice bags. If, after a few days, the tumor becomes red about its circumference and the pain, of a pulsating character, shows a tendency to increase, and if there is some elevation of temperature, the clot should be emptied at once.

If the hematocele occurs as a complication of labor, an effort should be made to secure its absorption, as a free incision in the presence of the probably contaminated lochia may be far from an innocent procedure.

CHAPTER II

LACERATIONS OF THE PERINEUM

Lacerations of the perineum imply a severance of the continuity of some or all of the structures embraced in what is sometimes designated as the perineal body. This, grossly speaking, is the pyramidal aggregation of integument, fascia muscles, and connective tissue that occupies the space between the orifice of the vagina and the anus, and that extends upward for about an inch and a half between the two canals.

The perineum may be lacerated by any form of violence, such as falling on hard or pointed structures, by early efforts at coition with a male organ of inordinate development, but most generally by the passage of the fetal head.

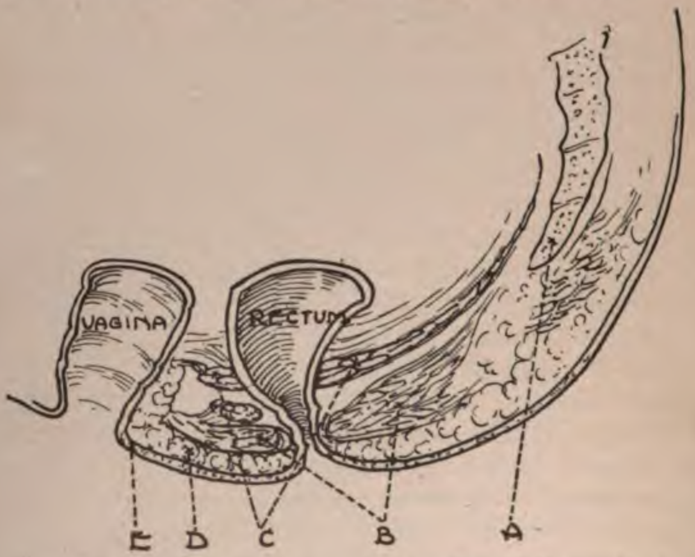


FIG. 36.—SCHEMATIC REPRESENTATION OF THE PELVIC FLOOR, SHOWING THE TWO MUSCULAR LAYERS. (A) Tip of coccyx; (B) superficial muscular layer; (C) deep muscular layer; (D) superficial fascia; (E) integument.

Classification.—Lacerations of the perineum may involve either the superficial or deep muscular layer (Figs. 37, 38), may be complete or incomplete. They are susceptible of more systematic classification according to the structures involved, as follows:

(a) Those involving the superficial vaginal membrane, the integument, and fascia.

(b) Those involving the integument, fascia, and the superficial layer of muscles.

(c) Those involving all the structures in class b, together with the deep muscular layer.

(d) Those involving all the preceding structures and more or less of the anterior wall of the rectum.

(a) Injuries simply involving the fourchette, a part of the marginal integument, some of the underlying fascia, and the lower segment of the vaginal lining occur in practically all normal deliveries. When the laceration is limited thus the underlying muscles, which are not injured, hold the torn margins in such apposition that spontaneous union takes place, at least to such extent that the remaining condition is not classified as abnormal and consequently calls for no treatment.

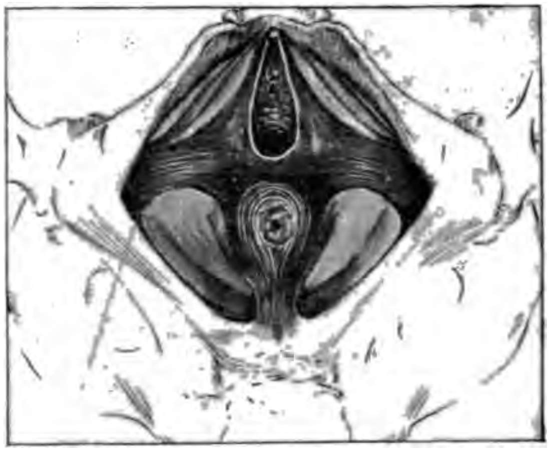


Fig. 37.—The External Muscular Layer, the Bulbocavernosus, Transversus Perinei, and the Sphincter Ani Muscle Converging to Form the "Perineal Body" or the Nidus Perinei.

(b) When the laceration involves the skin fascia and superficial muscular layer, in whole or in part, the condition becomes distinctly pathologic. There is a marked widening of the vaginal outlet and a consequent removal of an important part of the support naturally furnished by the pelvic floor to the superimposed viscera. This, in many instances, is the obvious beginning point in the descensus of the bladder, rectum, uterus, and adnexa. It is important to remember that the external layer of muscles embraces the bulbocavernosus, the transversus perinæi, and the sphincter-ani muscle, with fibers from the pubococcygeus and the obturator-coccygeus muscles. These muscles meet at a central point of convergence, which may with propriety be designated the *nidus perinei* (Fig. 38). The *perineum* proper is a pyramidal structure, the base of which lies between the fourchette and the anus, while its apex blends with the rectovaginal septum; its essential structures are derived from and constitute a part of the external muscular layer of the pelvic floor.

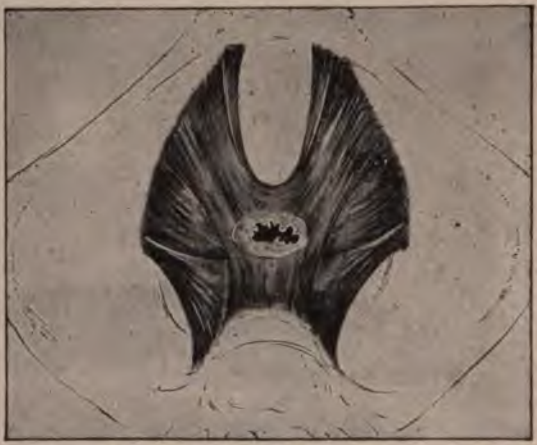


FIG. 38.—THE DEEP MUSCULAR LAYER; THE ISCHIOCOCCYGEUS, THE ILEOCOCCYGEUS, THE PUBOCOCCYGEUS, AND THE PUBORECTALIS MUSCLES, THE TWO LATTER CONSTITUTING THE LEVATOR ANI MUSCLE.

(c) In injuries to the pelvic floor involving not only the skin fascia and superficial muscular layer, but the deep or internal muscular layer, the rectum may or may not be injured. The internal muscular layer of the pelvic floor occupies a plane 1.5 centimeters above the external layer and consists of four paired muscles, viz.: the ischiococcygeus, the iliococcygeus, the pubococcygeus, and the puborectalis, the two latter coalescing to form the levator ani muscle (Fig. 39). The ischiococcygeus, which arises from the spine of the ischium and is inserted into the lateral border of the lower part of the sacrum and the upper part of the coccyx, and the iliococcygeus, which arises from the iliac portion of the obturator fascia and is inserted into the lateral border of the lower part of the coccyx, have comparatively little remaining physiological importance or surgical significance.

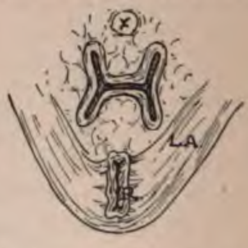


FIG. 39—TRANSVERSE SECTION SHOWING NORMAL RELATIONS OF THE URETHRA, VAGINA AND RECTUM AT THE LEVEL OF THE DEEP MUSCULAR LAYER, L–A BEING THE LEVATOR ANI MUSCLE OF THE LEFT SIDE, THE DECUSSATING FIBERS NOT BEING SHOWN (after McKay).

The remaining two muscles, however, are of extreme importance, as explained by M. L. Harris, as follows: "The pubococcygeus arises from the lower border of the symphysis ossis pubis, from the posterior surface of the os pubis, and from the obturator fascia as far back as the iliopectineal eminence. From this somewhat extensive origin the fibers pass mesodorsad, passing by the urethra, the vagina, and the rectum, lying cephalad of the lower portion of the iliococcygeus, and are inserted with those of its fellow from the opposite side by means of a tendinous expansion into the ventral surface of the coccyx and the lower part of the sacrum, the more ventral fibers interlacing directly with those of its fellow as a girdle posterior to the rectum. The puborectalis lies beneath, or caudad of, the ventral portion of the pubococcygeus, from which it is separated ventrally by an intermuscular fascia. It arises from the lower portion of the symphysis ossis pubis, or from the beginning of the descending ramus and the cephalic surface of the urogenital fascia. Its fibers usually form a well-defined muscular loop which passes dorsad, encircling the rectum at the perineal flexure, where it becomes continuous with its fellow. In passing by the rectum some of its fibers enter the wall of the rectum, gradually become tendinous, and pass caudad as far as the cutaneous surface. A few fibers also pass anterior to the bowel between it and the transversus-perinei muscle of the opposite side. The pubococcygeus and the puborectalis together form what is generally termed the *levator-ani muscle,* and are the most important muscles of the pelvic floor. They produce the characteristic perineal flexure of the rectum and vagina and form the chief support of the pelvic viscera. They must undergo the greatest elongation during the dilatation of the pelvic outlet for the passage of the child, and, therefore, are most liable to suffer rupture or laceration, as will be shown later. The more ventrally placed fibers pass almost directly ventrodorsad, while on frontal section the muscular plane slopes from the periphery toward the center and cephalocaudad. In the space between the opposite muscles ventrally pass the vagina and urethra, and it is extremely important to clearly understand the relations of these muscles to the lateral wall of the vagina."

(d) Laceration of the perineum extending from the vagina into the rectum and involving the septum, generally to a point above the internal muscular layer, is called complete. In both its causation and consequences it involves the same physics that is exemplified in deep but incomplete laceration, with the added complication of fecal incontinence. In this connection it is important to remember, as further explained by Harris, that the normal virgin vagina is not a simple straight tube. In passing from without inward, the general direction of the vagina, for a distance of 1.5 to 2 centimeters within the hymen, is dorsocephalad. At this point a distinct change in direction takes place and the vagina passes almost directly dorsad. The point of angulation lies opposite, and corresponds to, the perineal flexure of the rectum, and is produced by the pubococcygeus and the puborectalis muscles encircling these canals at this point and drawing them forward, or in a ventral direction. With the finger introduced into the vagina one is able easily to recognize the point of angulation and distinctly to feel the edge of the puborectalis muscle through the lateral wall of the vagina, as it passes in its course toward the symphysis. "An incision through the lateral wall of the vagina 1 to 2 centimeters to the inner side of the hymen or its remains will expose the median edge of this muscle. It may easily be dissected up almost from its origin from the symphysis ossis pubis to the rectum, and in passing by the vagina its fibers do not enter or form an attachment directly to the vaginal wall. The muscle varies from 3 to 6 millimeters in thickness, and extends in connection with the pubococcygeus laterally to the wall of the pelvis, the plane in the transverse direction being oblique to the wall of the vagina. That portion of the vagina lying internal to the point of angulation or perineal flexure, and which composes by far the major portion of the canal, lies in its ventrodorsad plane almost parallel with the muscular plane, and rests on it, the rectum alone intervening." Contraction of the muscles of this layer tends to increase the perineal flexure of the rectum and vagina by drawing the parts in a ventrocephalic direction, and the opening through the muscular floor is thereby maintained ventrad of the line of gravity. The weight of the pelvic organs is thus brought to bear on the muscular layer of the pelvic floor; that mass of tissue ordinarily called the perineal body, lying between the rectum and the vagina, and extending from the inner muscular floor of the pelvis to the cutaneous surface, has little or nothing to do with sustaining the pelvic organs.

Symptoms and Diagnosis.—Many cases of injured perineum go to advanced life without detection; some doubtless are never detected. On the other hand, many cases give rise to symptoms that attract attention from the start. These symptoms vary with the extent and character of the injury and with the period of its duration.

Recent injuries of the perineum, i. e., injuries at the time of their occurrence, are to be detected by their physical appearance. The condition of the perineum should be systematically and thoroughly examined by both actual inspection and by touch immediately after the conclusion of every labor. If this is systematically done there will be fewer practitioners boasting of their hundreds of thousands of deliveries "without a tear." According to Whitridge Williams, slight tears involving the fourchette occur in about two-thirds of all primiparæ, and in ten per cent. of multiparæ. Deeper tears are equally inevitable in a certain smaller proportion of cases. Neither the superficial nor deep cases can readily be diagnosticated at the time of delivery by digital examination alone, as the soft and spongy condition of the parts makes it practically impossible to determine their condition by touch alone.

Every case should be carefully inspected. This will reveal various types of tears (Figs. 40 and 41).

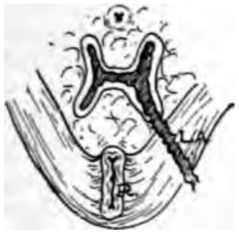


FIG. 40.—RUPTURE OF THE VAGINA, THE LACERATION EXTENDING THROUGH THE LEFT LEVATOR ANI MUSCLE (after McKay).

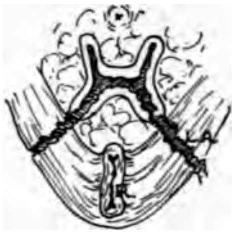


FIG. 41.—RUPTURE OF THE VAGINA, THE LACERATION EXTENDING THROUGH THE LEVATOR ANI MUSCLE ON BOTH SIDES (after McKay).

If the injury is *superficial*, and not recent, involving externally only the structures of the fourchette, but internally more but yet superficial vaginal structures, the actual nature of the trouble may be unsuspected. The skin is left intact, and this is taken for a sound perineum. Or the tear may involve the skin down to, but not through, the sphincter ani. Sooner or later, however, the patient becomes conscious of a lack of support in the perineal region. She feels as if everything were about to drop out. Occasionally there is actual bulging at the vaginal orifice. This is made worse by straining at defecation. Now and then there may be audible discharge of air from the vagina—a most annoying and significant complication—due to the fact that in certain postures the vagina becomes filled with air. Irritability of the bladder with frequent desire to urinate is a frequent but not constant symptom. General pelvic dis-

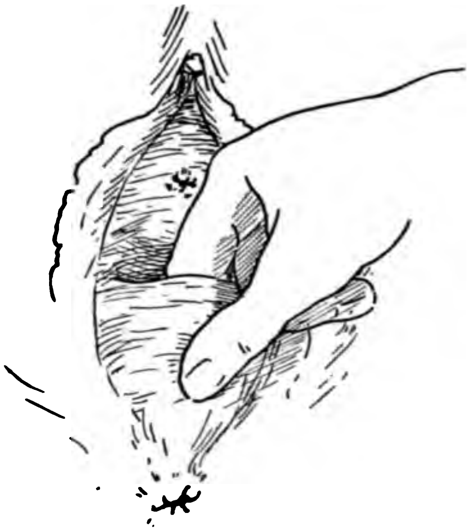


FIG. 42.—DIGITAL DIAGNOSIS OF RELAXED VAGINAL OUTLET.

tress, with pain in the loins, and later coccygeal pains, are complained of, the latter at times radiating down the thighs.

Examination under these circumstances should be made first with the patient on her back, and next in the upright posture. With the patient in the position of dorsal decubitus the vulva on inspection may seem normal, or relatively normal. Or its outlet may seem relaxed and a soft bulbous mass in front (the bladder), or another behind (the rectum), or both, may present at the ostium. Occasionally the cervix uteri is seen at the same level. If the patient is now asked to strain downward or to cough, these presenting parts will respond to the effort. Digital exploration, even with the skin intact, will reveal a relaxed state of the tissues. One or two or even more fingers may be introduced within the vagina, and, with the palmar surface outward, be made easily to distend the perineum (Fig. 42). If the digital examination is repeated with the patient standing, the downward displacement of the bladder, rectum, uterus, and superimposed organs may be more accurately determined.

If the injury is *complete*, i. e., if it involves the sphincter ani muscle and the wall of the rectum, the preceding conditions will be present in whole or in part. Fecal incontinence will, however, have been a persistent symptom from the date of the injury. If the patient is examined on her back the vaginal orifice should be drawn open with the index finger of each hand (Fig. 43). This will reveal not only a

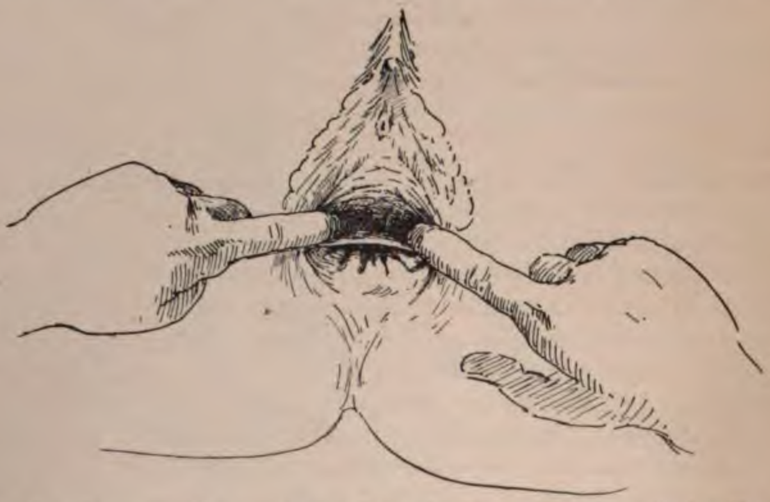


FIG. 43.—COMPLETE LACERATION OF THE PERINEUM. The vaginal orifice is drawn open by the index finger of each hand, showing the white line along the margin of the thin remnant of the rectovaginal septum.

relaxed outlet, but the white line on the margin of the thin remnant of the rectovaginal septum.

Treatment.—The treatment of tears of the perineum is always surgical, and is based upon the principle that the parts ought to be restored as nearly as possible to their anatomical integrity. Procedures to accomplish this end resolve themselves into those addressed to (1) recent tears, both complete and incomplete; (2) superficial or incomplete tears that are not recent; (3) deep or complete tears that are not recent; and (4) modified procedures, the details of which are determined by the direction and other details of the injury as it occurs in individual cases.

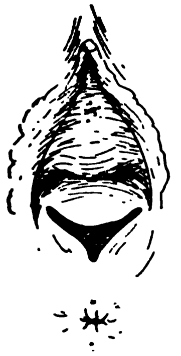


FIG. 44.

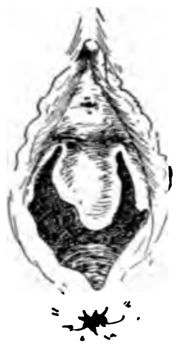


FIG. 45.

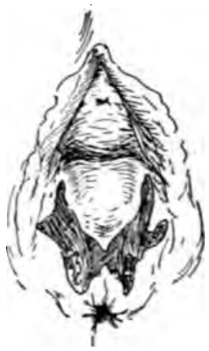


FIG. 46.

FIG. 44.—SUPERFICIAL TEAR OF PERINEUM AT TIME OF OCCURRENCE (after Williams).

FIG. 45.—DEEP TEAR BUT NOT INVOLVING SPHINCTER ANI MUSCLE, AS SEEN AT TIME OF OCCURRENCE (after Williams).

FIG. 46.—COMPLETE TEAR INVOLVING ALL THE PERINEAL STRUCTURES AS SEEN AT THE TIME OF OCCURRENCE (after Williams).

PRIMARY OPERATIONS FOR REPAIR OF THE PERINEUM.—Procedures for immediate repair of the lacerated perineum must vary according to the direction and extent of the injury. They should also be arranged with respect to the muscular elements then and subsequently involved in the condition.

If the injury is median and superficial (Fig. 44) a couple of sutures carried to the bottom of the tear may be sufficient to approximate the denuded surfaces.

If the tear is of the deep but not complete variety (Fig. 45) it should be remembered that the transversus perinei muscle in particular is holding, and, if not controlled, will continue to draw apart the deeper denuded surfaces and thus prevent union. When, therefore, immediate repair is attempted, at least two deep sutures should be so passed as to hold the torn ends of this muscle in apposition; this is best done by figure-of-eight sutures, silkworm gut being the material used (Fig. 47). Unless this precaution is taken there will be muscular retraction beneath the superficial union, and a relaxed vaginal outlet will be the result.

If the tear is complete (Fig. 46) it will have involved not only the superficial but the deep muscular layer of the perineum, as well as the sphincter ani muscle, all of which should be brought under control by the reparative procedure. All of this cannot be done in every case by immediate operation; indeed, the high percentage of failures is so great that, if anything at all is done at the time of accident, it is questionable whether more than partial restoration should be attempted. If the completed operation is undertaken, and the ends of the sphincter ani are brought together, the resulting pressure from gas and feces will nearly always force a fistula in spite of the use of a rectal tube, which generally cannot be worn. It is, therefore, probably better to pass a series of sutures from the vaginal side down to, but not through, the rectal mucosa, and to discontinue the approximation just within the plane of the sphincter ani muscle. This procedure will generally result in union of the surfaces thus approximated, and, although it necessarily leaves a state of temporary fecal incontinence, it also leaves the patient the prospect of permanent recovery following a single subsequent operation. Several weeks or months should elapse after this partial restoration before the secondary operation is undertaken.

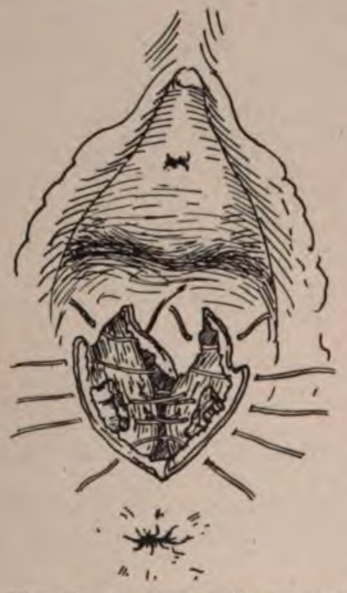


Fig. 47.—Immediate Repair of Deep but not Complete Laceration of the Perineum. This shows two figures-of-eight inserted to control the levator ani muscle.

Secondary Operations for the Repair of Incomplete Tears of the Perineum.—The technique for the secondary repair of deep but incomplete laceration of the perineum has undergone many modifications since Emmet first described his procedure. The claims for originality have become so numerous, and are based upon such slight innovations, that an attempt to recognize them in detail would be absurd.

A careful examination of all the modifications shows that they are but elaborations of two fundamental methods, viz.:

(1) The Emmet procedure, which sought to restore the anatomical integrity of the parts by cutting away all cicatricial and redundant tissues preliminary to the coaptation of the structures—the so-called denudation method.

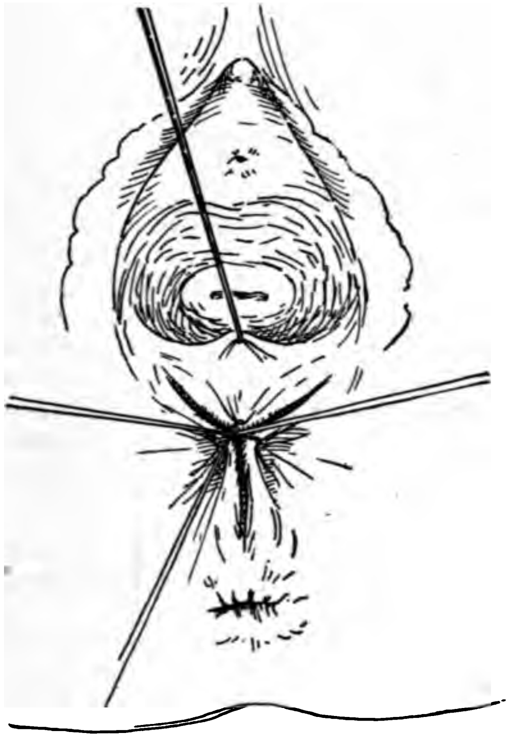


FIG. 48.—(16) AUTHOR'S PROCEDURE OF PERINEORRHAPHY FOR PARTIAL LACERATION. (a) Area of denudation to be made and lines of subsequent coaptation.

(2) The Lawson Tait procedure, which sought to restore the anatomical integrity of the parts by separating the layers of tissues preliminary to the coaptation of the structures—the so-called flap-splitting method.

Each method will be described with such variations in technique as the writer has either devised or adopted to increase its efficiency. Other variations may seem as effective, especially to meet individual peculiarities.

Perineal operations are done with the patient on her back.

OPERATIONS FOR INCOMPLETE LACERATIONS

DENUDATION OPERATIONS

16. AUTHOR'S PROCEDURE FOR REPAIR OF INCOMPLETE LACERATION OF PERINEUM[1]

The denudation procedure has been evolved until its most effective exemplification, in the author's opinion, may be described as follows:

(1) The index finger of the left hand is introduced, palm forward, into the rectum, and is utilized to bring the anterior rectal wall forward into the vulvar cleft.

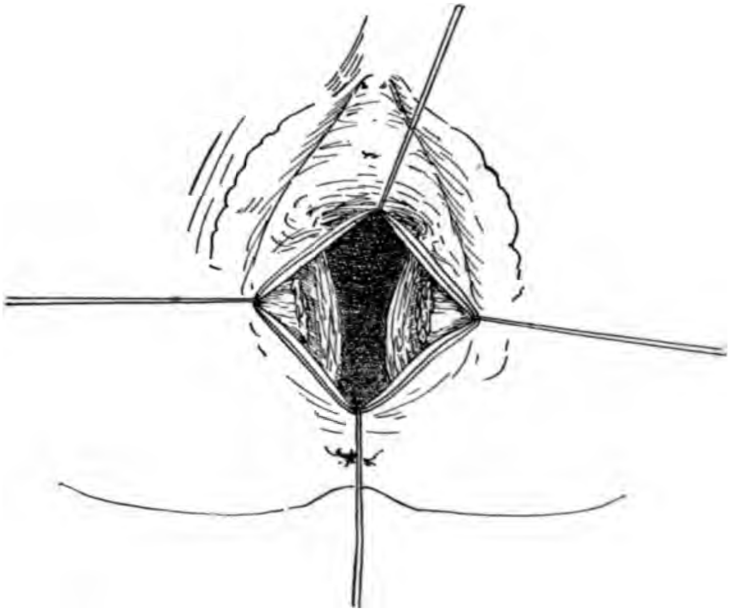


Fig. 49.—(16) Author's Procedure of Perineorrhaphy for Partial Laceration. (b) Area of denudation with location of the two muscular layers. The reversed ends of the transversus perinei and, deeper, the levator ani muscles are shown.

(2) A volsellum is inserted at the apex of this protrusion; (b) another is introduced at each side of the vaginal orifice at the point on either side marked by the lowest of the carunculæ myrtiformes; (c) a fourth tenaculum is introduced in the integument, midway between the two lateral ones.

---

[1] First described in Journal of American Medical Association, 1903; also in Reed, "Text Book of Gynecology," D. Appleton & Co., second edition, 1903.

(3) Traction outward from the center made upon these tenacula will outline the area of tissue, cicatricial and redundant, to be removed for the purposes of denudation, while the two lateral ones brought together in the median line will indicate the lines of subsequent superficial approximation (Fig. 48).

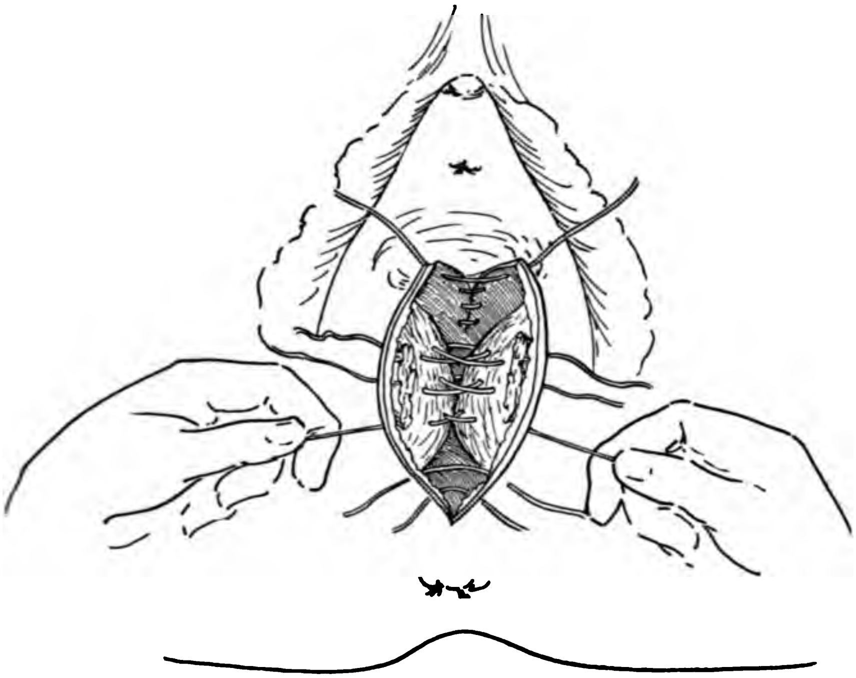


FIG. 50.—(16) AUTHOR'S PROCEDURE OF PERINEORRHAPHY FOR PARTIAL LACERATION. (c) Method of suturing. Those on the vaginal wall are already tied; the marginal or fourchette suture is ready to be tied; three figure-of-eight sutures holding the levator ani in their inner loop and the transversus perinei fascia and skin in their outer loop are also ready to be tied, and two superficial sutures have been inserted lower down.

(4) The surface within the tenacula is then denuded of its cicatricial and other layers, the dissection being carried deep enough laterally to expose both the superficial and deep transverse muscular layers on each side (Fig. 49).

(5) Figure-of-eight sutures—two or three in number—silkworm gut being used, are then so inserted that they embrace the levator ani of both sides within their inner loop, and the transversus perinei superficial fascia and integument within their outer loop (Fig. 50).

(6) Two or three additional sutures, relatively superficial, are required within the vagina, and possibly upon the perineal surface.

(7) The "crown suture" is inserted upon either side at a point corresponding to the two lateral tenacula.

(8) The sutures are then tied, beginning with the upper vaginal ones, and then with the lower figure-of-eight (Fig. 50), the crown suture being tied last. It is sometimes not inserted until the other sutures are tied.

(9) The sutures should be left in position about ten days. The figures-of-eight are easily removed if they are cut one day and taken out the next.

Some modifications of the denudation technique are made necessary or desirable to meet variations in the details of the incomplete injury to be treated; others must be mentioned to be condemned.

17. EMMET PROCEDURE FOR LACERATED PERINEUM

This should not be called a modification at all, as it was the original operation. The denudation is carried up each side of the vagina and on either side of a central flap, the two sulci thus formed being closed by interrupted sutures passed deeply through all the structures (Figs.

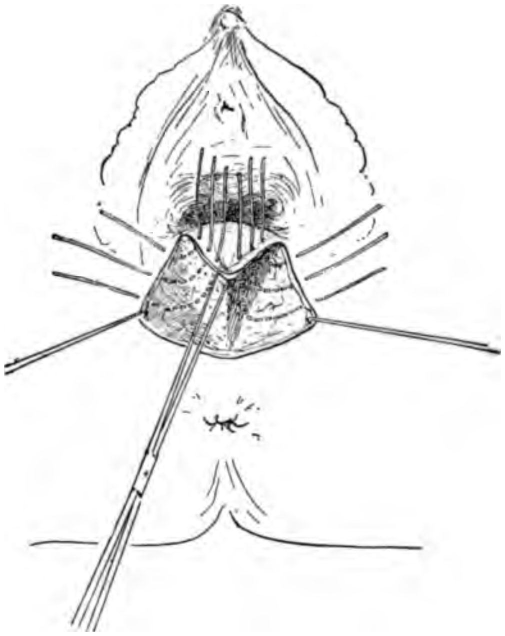


FIG. 51.—(17) EMMET PROCEDURE FOR REPAIR OF PARTIAL LACERATION OF THE PERINEUM. (a) Area of denudation with sutures inserted.

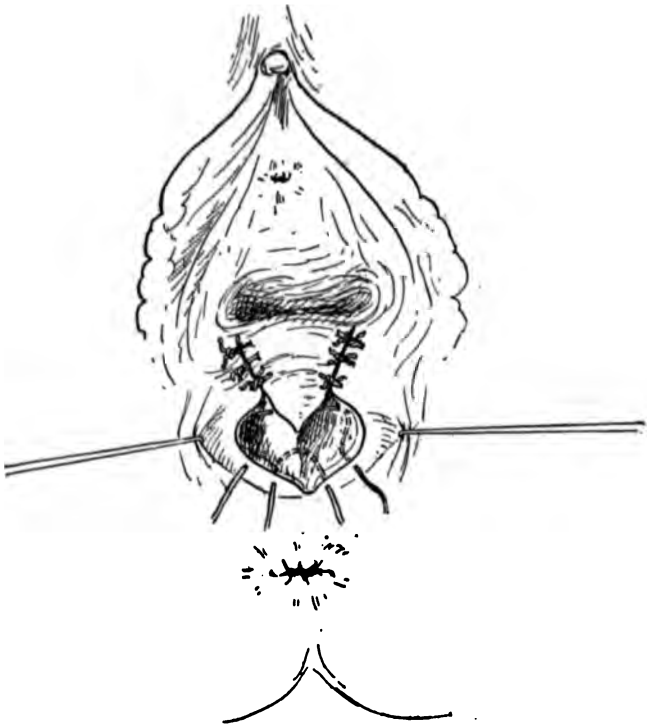


Fig. 52.—(17) Emmet Procedure for Repair of Partial Laceration of the Perineum. (b) Vaginal sutures tied and others ready to be tied.

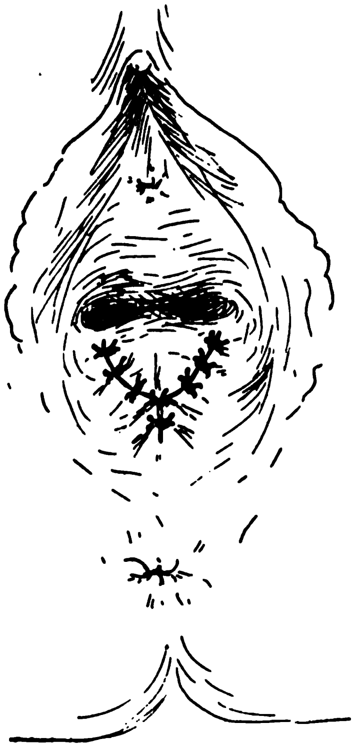


Fig. 53.—(17) Emmet Procedure for Repair of Partial Laceration of the Perineum. (c) Operation completed.

51, 52, 53). This procedure is of special value in that form of deep tissue injury or subcutaneous laceration sometimes designated as relaxed vaginal outlet. The Emmet method of suturing in cases of complete tear is indicated in Fig. 54.

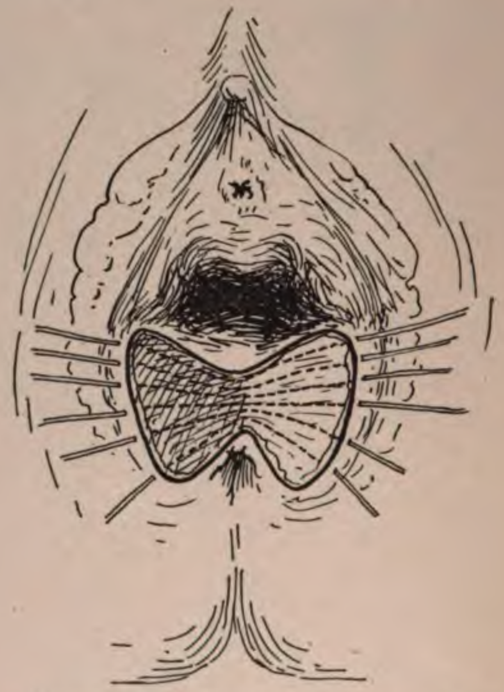


FIG. 54.—EMMET PROCEDURE IN COMPLETE LACERATION OF THE PERINEUM.

18. ANDREWS PROCEDURE FOR LACERATED PERINEUM

This procedure has a central flap, like the Emmet, the essential feature being the manner of introducing the superficial sutures (Fig. 55). Unless the deep sutures effect approximation of the muscular layers the results of this technique will be disappointing.

19. MARTIN PROCEDURE FOR LACERATED PERINEUM

Martin seeks to eliminate the redundancy of the posterior vaginal wall by removing a crescentic piece transversely at the vaginoperineal juncture, and by removing two longitudinal strips from the floor of the vagina. These two longitudinal denudations are then closed, after which the crescentic area is folded upon itself to form the cutaneous perineum. The method of denudation and suturing is shown (Figs.

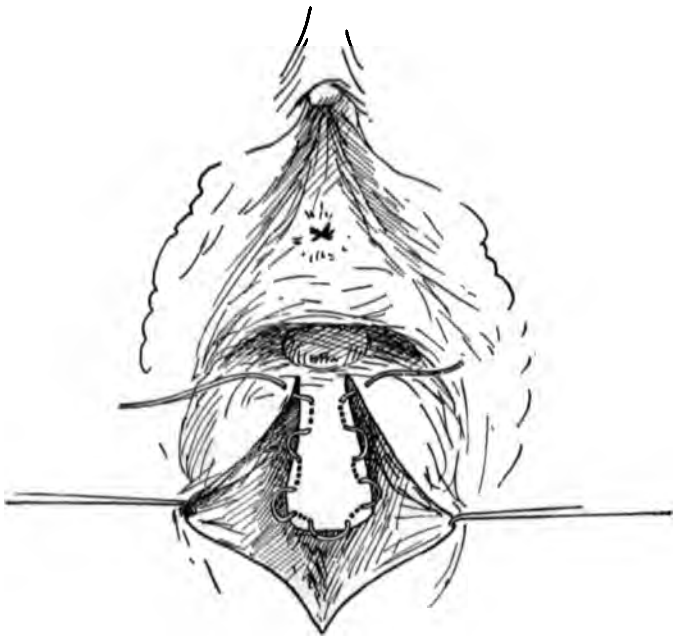


Fig. 55.—(18) Andrews Method of Suturing the Central Flap in Operation for Incomplete Tear of the Perineum.

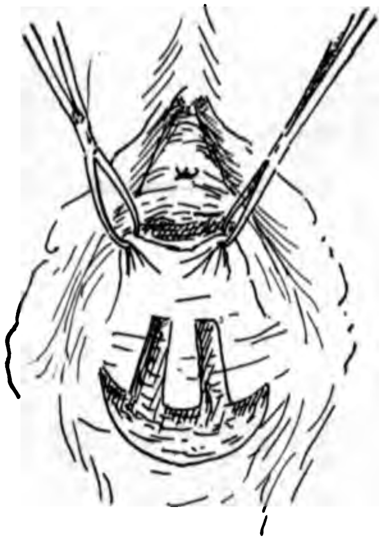


Fig. 56.—(19) Martin Modification of the Emmet Procedure. (a) Two denuded slits in the vaginal wall are made to communicate with the crescentic denudation of the perineum. The superficial character of the operation will be noted (after Montgomery).

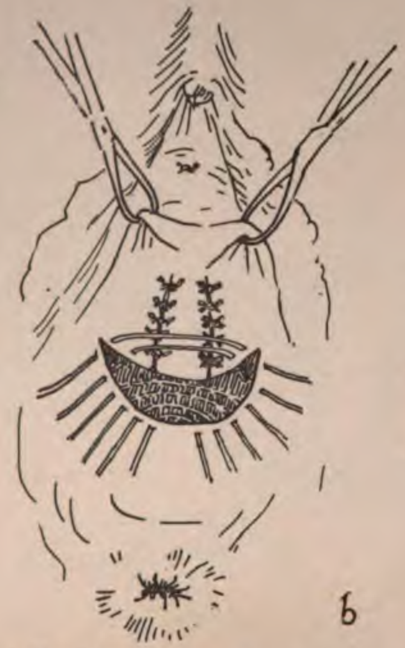


FIG. 57.—(19) MARTIN MODIFICATION OF THE EMMET PROCEDURE. (b) The vaginal sutures are tied and the perineal sutures are ready to be tied (after Montgomery).

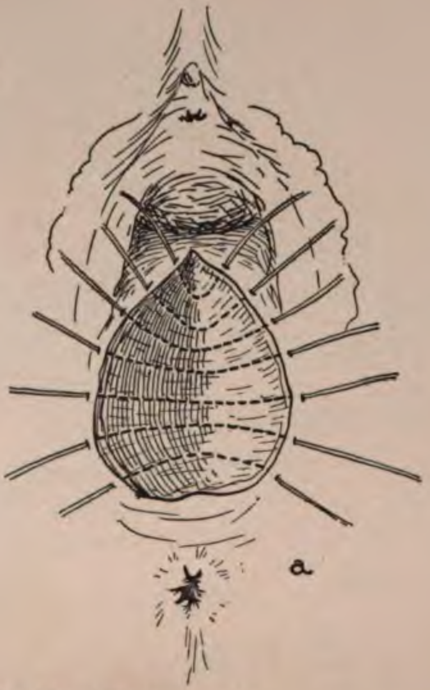


FIG. 58.—(20) DUDLEY MODIFICATION OF THE EMMET PROCEDURE. (a) The denudation has been completed and the sutures inserted (after Montgomery).

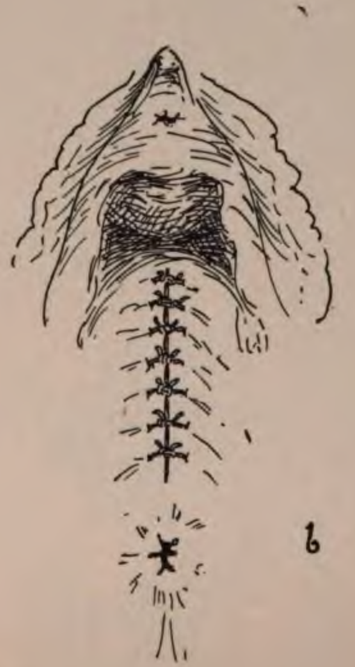


FIG. 59.—(20) DUDLEY MODIFICATION OF THE EMMET PROCEDURE. (b) The sutures are shown tied. The necessities of illustration make it impossible to show the perineal margin at the fourchette (after Montgomery).

56, 57). The objection to this procedure is that it deals only with superficial structures, and does not correct the more essential injury to the muscular structures.

20. DUDLEY PROCEDURE FOR LACERATED PERINEUM

Dudley, in certain cases, does away with the central flap of the Emmet procedure. His method of completely burying the sutures in passing them from side to side (Fig. 58) has a tendency, when the sutures are tied, to compress the approximated surfaces, and thus limit the areas available for union. The restoration of the margin of the fourchette (Fig. 59) is probably less satisfactory than by the author's method.

21. SIMON-HEGAR PROCEDURE FOR LACERATED PERINEUM

This consists in effecting an area of denudation which, when com-

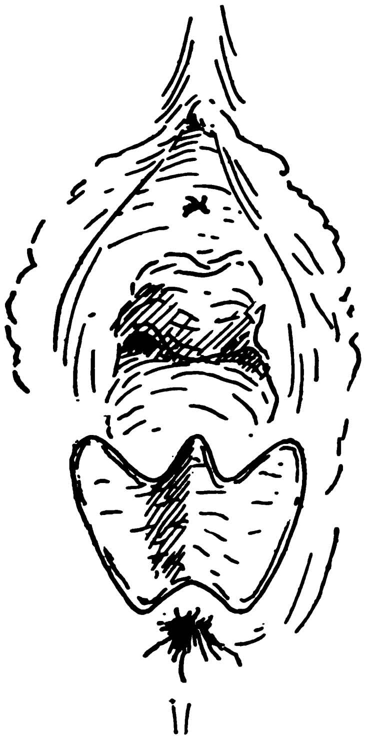


Fig. 60.—(21) Simon-Hegar Modification of the Emmet Procedure. (a) The median flap is eliminated by this butterfly denudation.

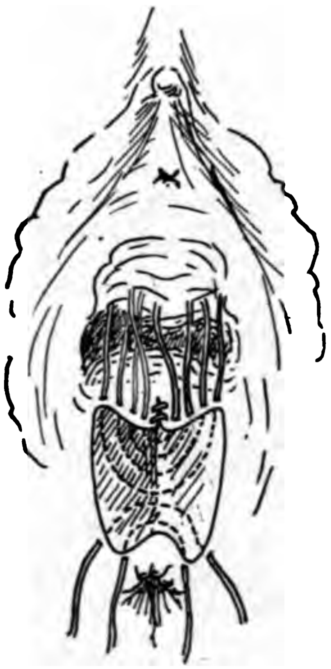


Fig. 61.—(21) Simon-Hegar Modification of the Emmet Procedure. (b) The sutures are all deeply inserted as indicated.

pleted, resembles the wings of a butterfly. The central flap of Emmet is eliminated (Fig. 60). The sutures are passed deeply under all the tissues (Fig. 61). Garrigues has modified this procedure by passing

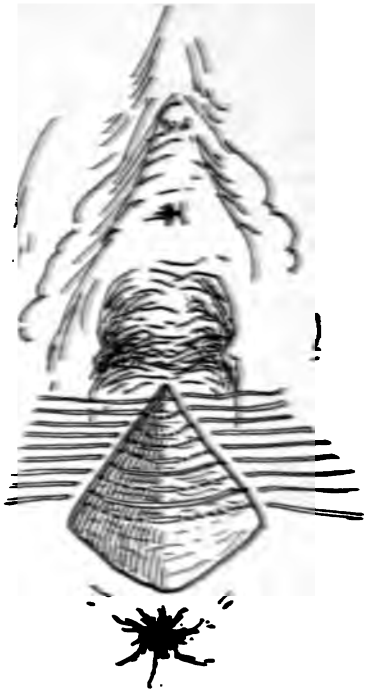


FIG. 62.—21 SIMON-HEGAR MODIFICATION OF THE EMMET PROCEDURE. (c) The sutures are inserted by Garrigues as here indicated.

some of the sutures from side to side at different levels (Fig. 62). Zinke, of the University of Cincinnati, has further modified the procedure by employing the laminated catgut suture, somewhat after the manner of Martin.

FLAP-SPLITTING OPERATIONS

22. AUTHOR'S PROCEDURE FOR REPAIR OF INCOMPLETE LACERATION OF THE PERINEUM BY THE FLAP-SPLITTING METHOD

The original technique of Lawson Tait for incomplete laceration of the perineum has been evolved but little beyond the point where its talented author left it. As I now practice this operation, it may be described as follows, viz.:

(1) The index finger of the left hand is introduced, palm forward, into the rectum, the anterior wall of which is thereby pushed into the vulvar cleft. This also brings the white cicatricial line at the cutaneous margin into plain evidence.

(2) The sharp pointed blade of a scissors is inserted in the middle line and pushed under the skin and fascia in the direction of, and until its point reaches, the lowest of the carunculæ myrtiformes, when the tissue is divided by a single cut along the white line on that side (Fig. 63).

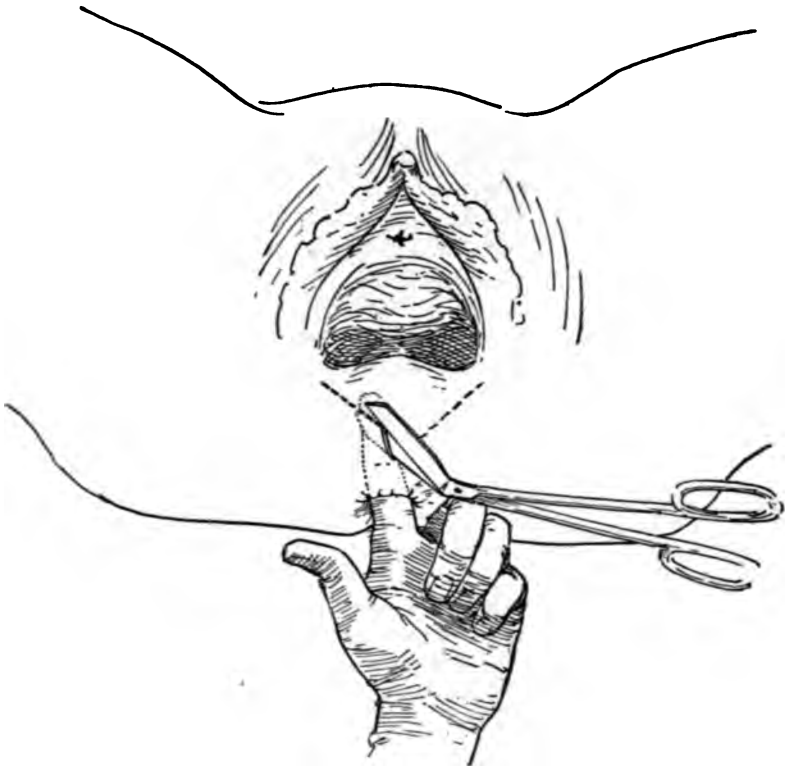


FIG. 63.—(22) PROCEDURE FOR REPAIR OF INCOMPLETE TEAR OF THE PERINEUM BY THE FLAP-SPLITTING METHOD. The perineum is distended with the finger in the rectum and the skin is cut along the "white line" which is located approximately as the dotted line in the drawing.

(3) The maneuver is repeated on the other side.

(4) The center of the upper flap is then seized with a hemostatic forceps, which is then entrusted to an assistant, who is instructed to make light upward traction with it.

(5) The two layers of the septum are now dissected from each

other with scissors to a depth that will permit the lateral perineal structures to be approximated in the median line beneath it. If very redundant, I prefer to remove a triangular piece from the vaginal flap.

(6) The dissection having now been completed, the left index finger is removed from the rectum and the glove of that hand is changed.

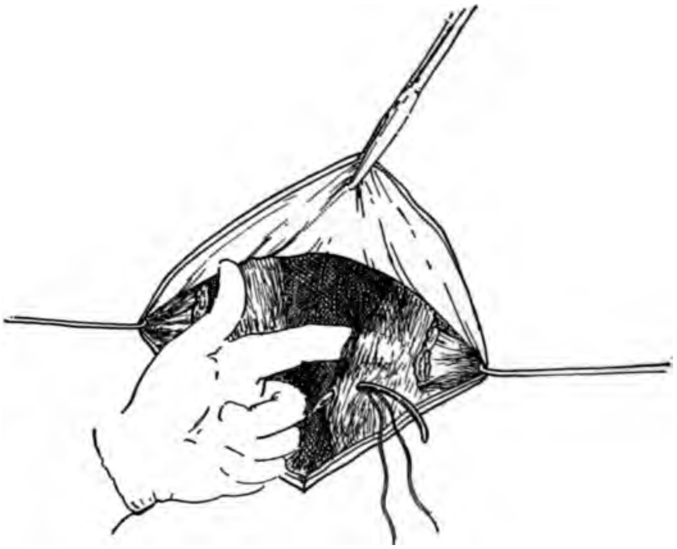


Fig. 64.—(22) Procedure for Repair of Incomplete Tear of the Perineum by the Flap-splitting Method. (b) The dissection is carried deeply enough to isolate the levator ani muscle on each side and bring it up either on the tip of the finger or by a hemostatic forceps.

(7) With the tip of the left index finger (Fig. 64), or with a hemostatic forceps, the levator ani of the left side is elevated and transfixed with a silkworm gut carried by a small Macewan's hernia needle or the ordinary curved needle.

(8) The same thing is done with the right levator ani, the same suture being used for the purpose.

(9) The two ends of the suture are successively reloaded on the needle, crossed over, and passed out through the transversus perinei, the fascia, and the skin.

(10) This process is repeated until from two to four figures-of-eight are inserted.

(11) Relatively superficial sutures of the same material, if required, are inserted below the figures-of-eight.

(12) A crown suture, passing from one upper angle of the denuded area to the other, and in transit transfixing the upper tip of the folded

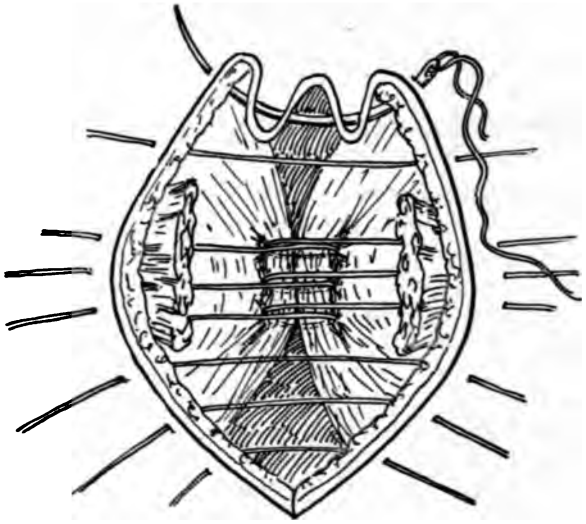


Fig. 65.—(22) Procedure for Repair of Incomplete Tear of the Perineum by the Flap-splitting Method. (c) The figure-of-eight sutures embracing the levator ani muscle from either side in their inner loop and the transversus perinei fascia and skin in their outer loop; the redundancy at the fourchette is controlled; a single modified purse-string suture and three superficial sutures are inserted below.

and more or less redundant posterior vaginal flap (Fig. 65 shows three figures-of-eight).

(13) The sutures are then tied, care being taken not to tie them too

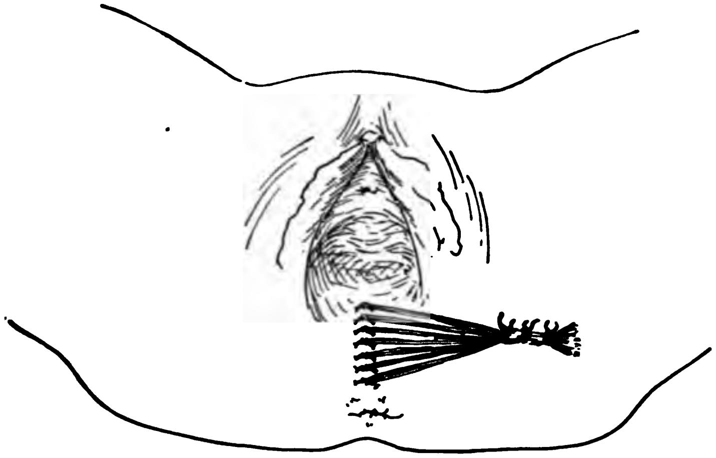


Fig. 66.—(22) Procedure for Repair of Incomplete Tear of the Perineum by the Flap-splitting Method. (d) All the sutures are left long, and sheaved at the end.

51, 52, 53). This procedure is of special value in that form of deep tissue injury or subcutaneous laceration sometimes designated as relaxed vaginal outlet. The Emmet method of suturing in cases of complete tear is indicated in Fig. 54.

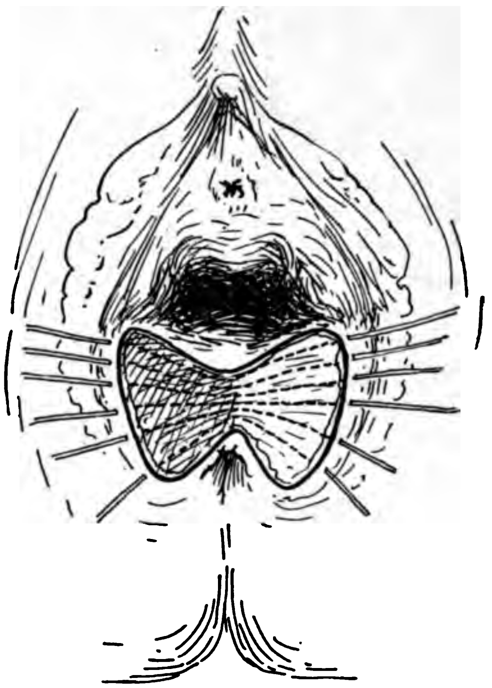


FIG. 54.—EMMET PROCEDURE IN COMPLETE LACERATION OF THE PERINEUM.

18. ANDREWS PROCEDURE FOR LACERATED PERINEUM

This procedure has a central flap, like the Emmet, the essential feature being the manner of introducing the superficial sutures (Fig. 55). Unless the deep sutures effect approximation of the muscular layers the results of this technique will be disappointing.

19. MARTIN PROCEDURE FOR LACERATED PERINEUM

Martin seeks to eliminate the redundancy of the posterior vaginal wall by removing a crescentic piece transversely at the vaginoperineal juncture, and by removing two longitudinal strips from the floor of the vagina. These two longitudinal denudations are then closed, after which the crescentic area is folded upon itself to form the cutaneous perineum. The method of denudation and suturing is shown (Figs.

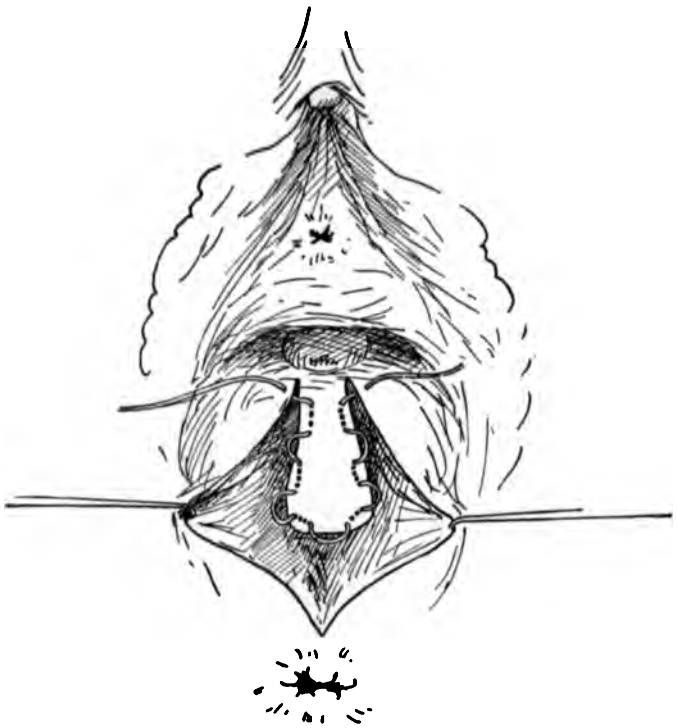


Fig. 55.—(18) Andrews Method of Suturing the Central Flap in Operation for Incomplete Tear of the Perineum.

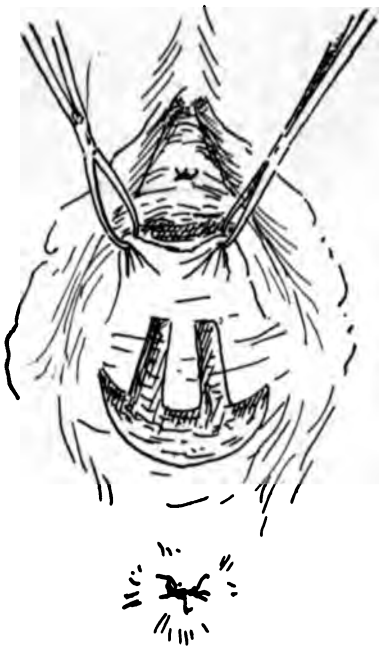


Fig. 56.—(19) Martin Modification of the Emmet Procedure. (a) Two denuded slits in the vaginal wall are made to communicate with the crescentic denudation of the perineum. The superficial character of the operation will be noted (after Montgomery).

(3) The two sides of the incision are then drawn apart until its two ends are brought together laterally, thus converting a transverse into a vertical incision (Fig. 71).

(4) Deep sutures are then passed from side to side, the "crown suture" and the cutaneous sutures in particular having been carried practically to the bottom of the incision, thus embracing both muscular layers of the perineum (Fig. 72).

(5) When the vaginal sutures are permitted to drop back a satisfactory fourchette becomes defined at the site of the "crown suture."

SECONDARY OPERATION FOR THE REPAIR OF COMPLETE TEARS OF THE PERINEUM

The fundamental principle in the repair of complete tears of the perineum (Fig. 41) is the anatomical restoration of the parts by tissue-to-tissue approximation.

(a) To be successful this tissue-to-tissue approximation must be maintained free from infection long enough to secure substantial union. If the supporting sutures are removed before this union has become firm there is liable to be separation of the essentially supportive structures. In this way it sometimes happens that superficially successful operation sooner or later develops into a case of relaxed vaginal outlet with all of its attendant evils. It is important, therefore, that the suture material employed should not absorb or be removed earlier than from ten days to two weeks.

(b) It is obvious that freedom from infection is essential to success. This is a matter for special consideration in this connection, because the proximity of the operation wound to the always infected rectum is to be recognized as a special source of danger. If the operation wound actually extends into or communicates with the rectum this danger is greatly enhanced. If the communicating operation wound involves the sphincter ani muscle, and if it extends upward along the anterior rectal wall above that muscle, the danger from contamination is obviously still further increased. This arises from the fact that, if the ends of the sphincter have been approximated, and if its function has thereby been restored, there will be a tendency for the gas and feces to be forced upward into the operation wound. It becomes an axiom, therefore, that the probability of freedom from contamination is relative to the completeness with which the rectum can be excluded from the manipulations incident to the operation.

The three criteria of success are, therefore, as follows, viz.:

(1) The tissue-to-tissue approximation of all structures that have

been torn apart, the rule applying with special force to the deep muscular layers of the perineum.

(2) The maintenance of tissue-to-tissue approximation long enough for the structures thus approximated to become firmly united.

(3) Freedom from wound infection, the most effective safeguard against contamination being the exclusion of the rectum from the field of operation.

DENUDATION OPERATIONS

The denudation procedure for repair of the complete laceration of the perineum is first considered because it was first in the order of historic development, and because many operators still employ it. It may, in fact, be essential in certain cases of extreme laceration, when it may be employed as either the first or both steps of a two-time operation. The objection to this procedure for an operation to be completed at a single sitting is that it leaves a part of the wound above the sphincter in communication with the rectum, and subject to the danger of infection from that source.

25. EMMET PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM

The technique originally devised by Emmet contemplated:

(1) The complete denudation of the area bordered by a point just below the retracted ends of the sphincter ani muscle to the lowest of the carunculæ myrtiformes on either side, vivifying the edges of the torn rectovaginal septum.

(2) The lowest suture is then passed through the skin, fascia, connective tissue, end of the sphincter ani muscle, connective tissue to the bottom of the tear, and out on the other side through connective tissue, end of the sphincter ani muscle, connective tissue, fascia, and skin.

(3) The sutures above the first define the same general course, but are on levels above the levator ani. These sutures focus at a point just back of the torn but now approximated surfaces (Fig. 54).

(4) The sutures are now tied on the perineal surface, care being taken that they are not tied so tightly as to induce tissue necrosis by pressure.

The chief objections to this operation are: (1) The denudation implies a sacrifice of tissue and, in effect, a further upward extension of the tear; (2) the closure of the wound, while effecting approximation of the skin margins, leaves a pouching wound on both the rectal and vaginal sides, both of which must almost inevitably become atria of infection; (3) suture pressure sufficient to secure coaptation of all the parts is often necessarily sufficient to induce tissue necrosis; (4) the number of failures characterized either by non-union or fistulæ was sufficient to justify a modification of the technique.

Modifications of the denudation procedure for repairs of complete tears of the perineum have been made chiefly to eliminate the objections summarized in the preceding paragraph.

26. MARTIN (A.) PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM

Martin sought to close the avenue for infection from the rectum and to secure tissue-to-tissue approximation by the following steps:

(1) The entire area is denuded (Fig. 73).

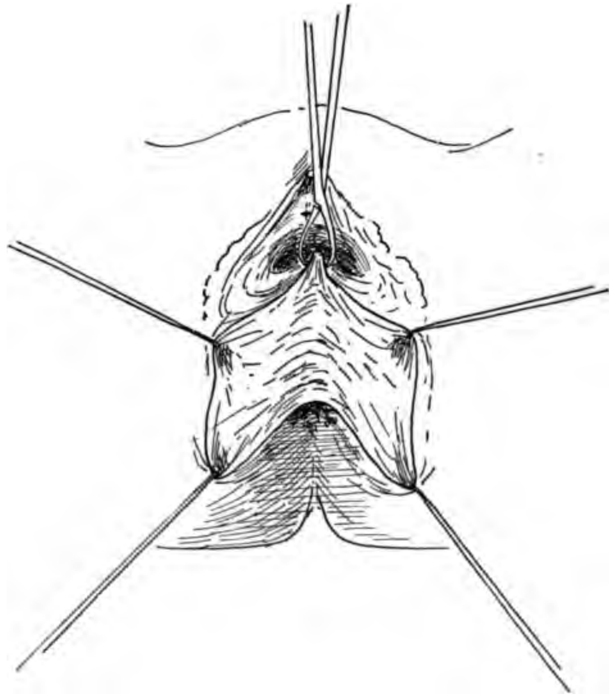


FIG. 73.—(26) MARTIN PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM. (a) The area of denudation is here shown.

(2) A catgut suture is introduced at the inner and upper angle and tied.

(3) The long end is then continued as a continuous over-and-over suture for the approximation, first of the upper angle of the wound and next the margins of the rectal mucosa (Fig. 74).

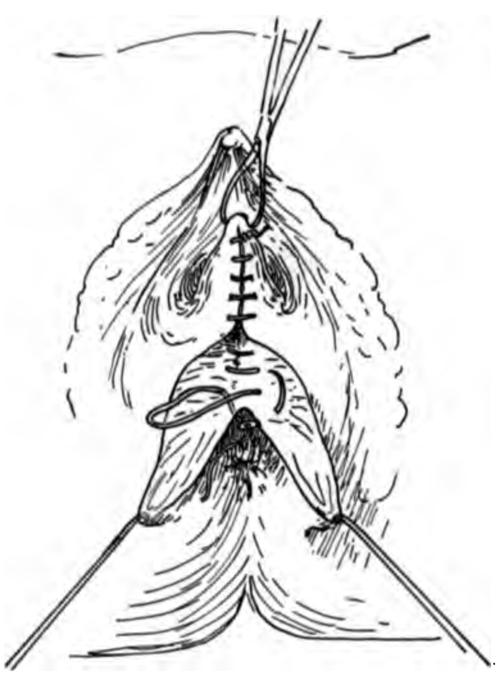
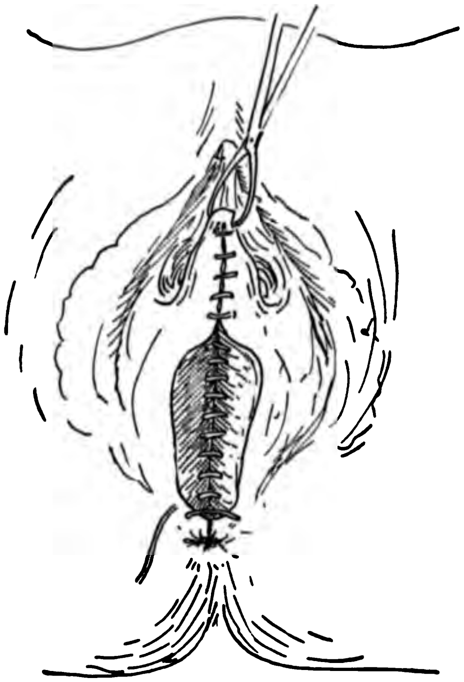


Fig. 74.—(26) Martin Procedure for Repair of Complete Laceration of the Perineum. (b) The method of building up the perineum by continuous laminated suture is here shown.



ig. 75.—(26) Martin Procedure for Repair of Complete Laceration of the Perineum. (c) The continuous suture has been utilized layer by layer until the operation wound is nearly closed.

(4) When the anal margin is reached the suture is carried back in the same way, care being taken to pick up the respective ends of the sphincter ani.

(5) This procedure is continued, backward and forward, until the tissues, layer by layer, have been approximated (Fig. 75).

27. LAUENSTEIN PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM

(1) The denudation is the same as in the Emmet procedure.

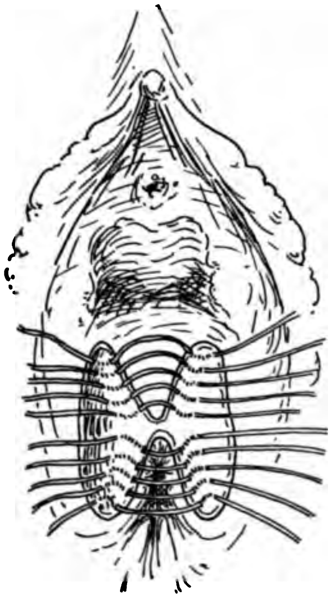


FIG. 76.

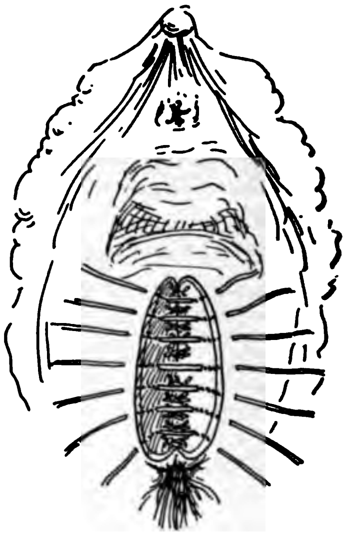


FIG. 77.

FIGS. 76 AND 77.—(27) LAUENSTEIN PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM.

FIG. 76.—(a) The sutures are inserted for closure of both the vaginal and rectal margins (after Monod and Vanverts).

FIG. 77.—(b) The vaginal and rectal margins are closed by sutures tied on the inside of the operation wound, and the superficial closure sutures are inserted preparatory to tying on the perineal surface (after Monod and Vanverts).

(2) The vaginal margins are closed by interrupted sutures, each being passed in and out, just beneath the vaginal membrane, carrying over to the other side, intersecting it at a corresponding point beneath the vaginal membrane, and out a little lower.

(3) The rectal margins are then treated the same way (Fig. 76).

(4) Both the vaginal and rectal sutures are cut short on the denuded side (Fig. 77).

(5) Deep sutures are now passed from side to side, beneath all tissues.

(6) The operation wound is then closed.

The Simpson operation is practically the same as that of Lauenstein.

28. KELLY PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM

This procedure is fundamentally an Emmet operation. During the last few years (1) Kelly has adopted my method of isolating the levator ani muscle, which, however, he transfixes and approximates with a suture passed from one lip of the vaginal wound to the other—probably a less reliable fixation than that by the perineum (Fig. 78). (2) He has also adopted Ristine's principle of dissecting loose and

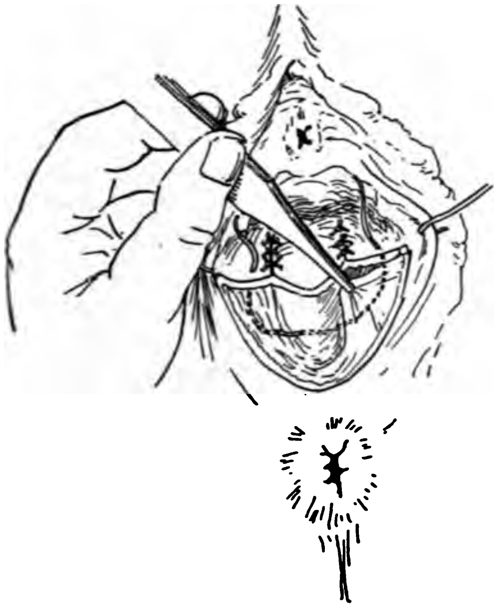


Fig. 78.

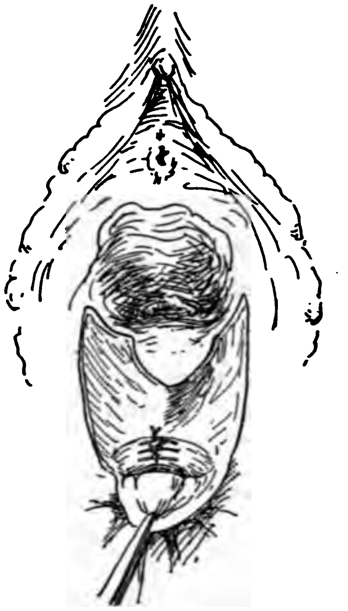


Fig. 79.

Figs. 78 and 79.—(28) Kelly Procedure for Repair of Incomplete Tear of the Perineum.

Fig. 78.—(a) Isolation of the levator ani muscle after the Reed method. (See Fig. 64.)

Fig. 79.—(b) The Ristine flap dropped down and the ends of the sphincter ani muscle stretched together.

dropping down a transverse flap to protect the operation wound from the rectum—both Ristine's and Kelly's innovations being adaptations of the flap-splitting principle of Lawson Tait (Fig. 79). (3) Kelly also isolates the retracted ends of the sphincter ani muscle and sutures them directly to each other (Fig. 79).

FLAP-SPLITTING OPERATIONS FOR COMPLETE LACERATIONS

29. AUTHOR'S PROCEDURE FOR REPAIR OF COMPLETE LACERATIONS BY THE FLAP-SPLITTING METHOD

The flap-splitting operation, devised and practiced by Lawson Tait, for complete tear of the perineum, has evolved in my hands until the resulting procedure may be summarized as follows:

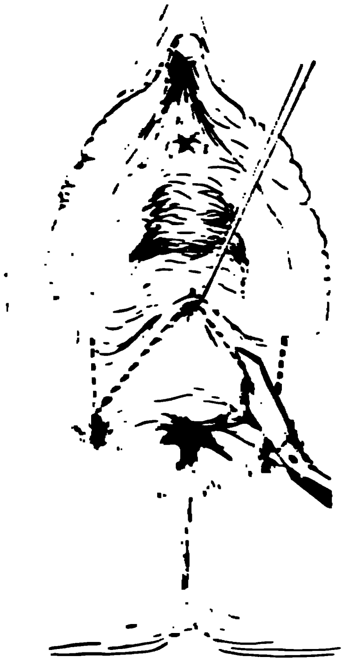


Fig. 80.—(29) Author's Procedure for Repair of Complete Laceration of the Perineum by the Flap-splitting Method. (a) The lines and [illegible] of making the

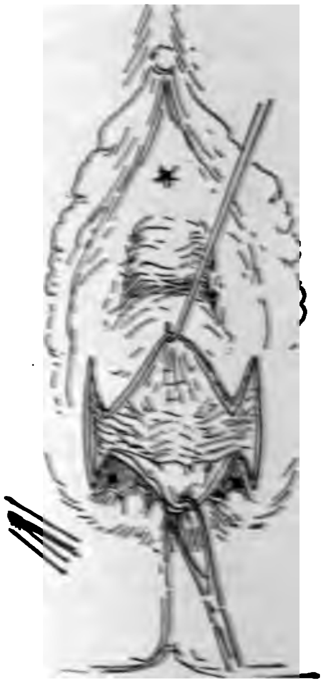


Fig. 81.—(29) Author's Procedure for Repair of Complete Laceration of the Perineum by the Flap-splitting Method. (b) The Ristine flap being dissected downward.

(1) The posterior vaginal membrane is picked up with a volsellum placed in the median line about two centimeters from the lower margin of the rectovaginal septum.

(2) Using the finger in the rectum as a guide, the sharp blade of a scissors is then thrust in about one centimeter above and a little outside the dimple of the retracted sphincter ani muscle, the point being carried up to the volsellum, when, with a single cut, the tissue is divided (Fig. 80).

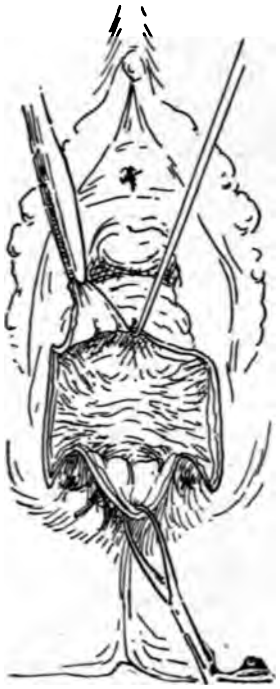


FIG. 82.—(29) AUTHOR'S PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM BY THE FLAP-SPLITTING METHOD. (c) The left upper flap cut away and the right upper flap ready to be cut away.

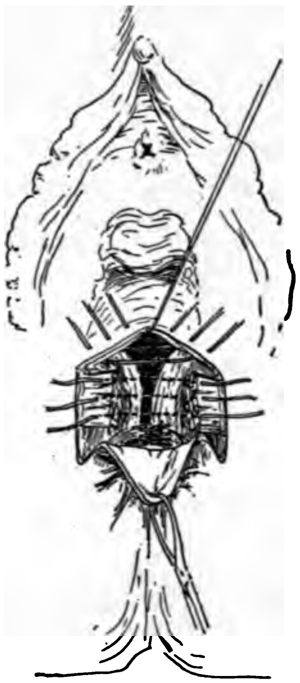


FIG. 83.—(29) AUTHOR'S PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM BY THE FLAP-SPLITTING METHOD. (d) The ends of the sphincter ani muscle united, the sutures in the levator ani inserted and ready to be tied, and the intravaginal sutures passed and ready to be tied.

(3) The same thing is done on the other side.

(4) The V-shaped flap—a modification of Ristine's flap—thus formed is seized with a forceps and permitted to hang down over the anus (Fig. 81).

(5) With the scissors the incision is carried down a little outside and below the sphincter dimple, and upward to the first of the carunculæ myrtiformes.

(6) The same thing is done on the other side (Fig. 82).

(7) The lateral vaginal flaps are now dissected up until the levator ani muscle is exposed on either side and the redundant ends of the flaps are cut away (Fig. 83).

(8) The ends of the sphincter ani muscle are now exposed, if necessary, by dissecting down the apron flap, when the muscle can ordinarily be drawn up by hemostatic forceps.

(9) The ends of the sphincter ani muscle are then stitched together with chromicized catgut.

(10) The levator ani and transversus perinei muscles and fascia are sutured together by chromic catgut (Fig. 83).

(11) The vaginal sutures and the upper cutaneous suture are now tied, leaving a triangular denuded area on the perineal surface.

(12) Into this triangular area the apron flap is adjusted by cutting away any redundancy and is then fixed by interrupted sutures (Fig. 84).

This modification of the original Tait procedure is of great importance in extreme lacerations.

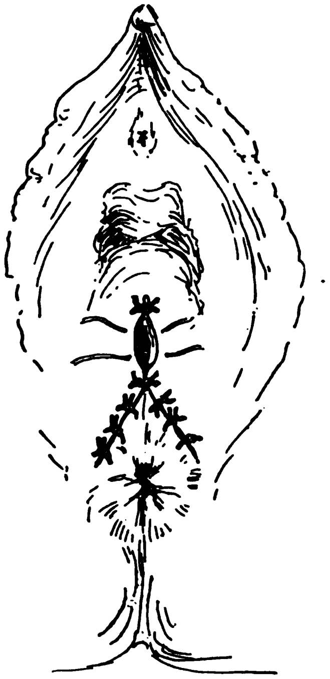


FIG. 84.—(29) AUTHOR'S PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM BY THE FLAP-SPLITTING METHOD. (e) The Ristine flap has been restored and fixed by interrupted sutures, and the vaginal sutures are ready for closure.

30. TAIT PROCEDURE FOR REPAIR OF COMPLETE LACERATION BY THE FLAP-SPLITTING METHOD

The original technique of the flap-splitting operation for complete tear of the perineum—the celebrated H operation—as devised by Lawson Tait, has been admirably illustrated by McKay and should be thoroughly understood.

(1) The lines of the incisions are indicated in Fig. 85.

(2) A bistoury or, preferably, a pair of keen-edged scissors curved on the edge or bent at an angle may be employed to divide the septum. This is done by carrying the incision from one side to the other, between the vaginal and rectal layers of the septum, to the depth of about a centimeter (Fig. 86).

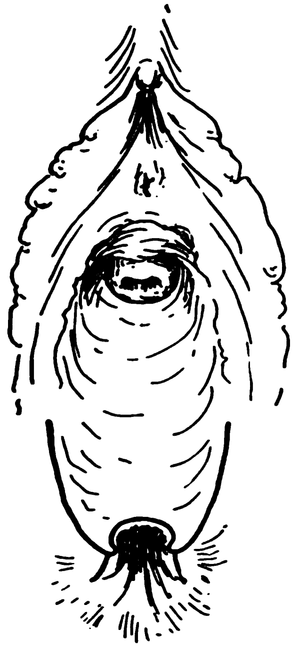


FIG. 85.—(30) TAIT PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM BY THE FLAP-SPLITTING METHOD. (a) The line of incision.

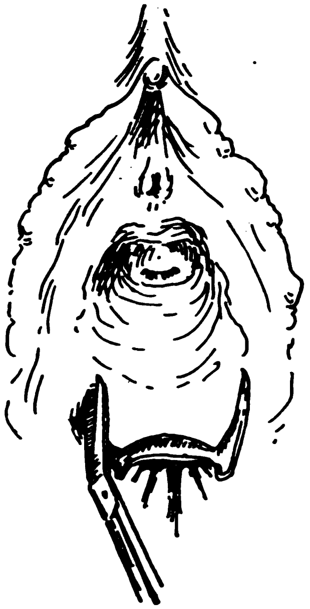


FIG. 86.—(30) TAIT PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM BY THE FLAP-SPLITTING METHOD. (b) The method of splitting the septum.

(3) The incision is next carried out to either side to the outer margin of the distinctly cicatricial area.

(4) Another incision is now made, beginning a little below and a trifle to the outside of the umbilicated point that indicates the location of one end of the retracted sphincter ani muscle. The incision is carried upward along the outer margin of the cicatricial area to its upper angle.

(5) A similar incision is now made on the opposite side. The three incisions unite to form the letter *H*. It will now be discovered that, by bringing the two upright lines of the *H* into approximation with the median line, there is a restoration of the original contour of

the parts. In the act of bringing them together the vaginal flap and the rectal flap of the septum separate, approximating the broad proximal surfaces. Before the sutures are applied a little more dissection may be required to expose the buried end of the retracted sphincter ani muscle. This precaution is important.

(6) Tait was in the habit of closing this operation by passing sutures of silkworm gut by means of the Peaslee needle. The principle which he always observed in suturing was to apply these interrupted silkworm gut sutures subcutaneously, the object being to draw forward and into approximation the retracted subcutaneous structures.

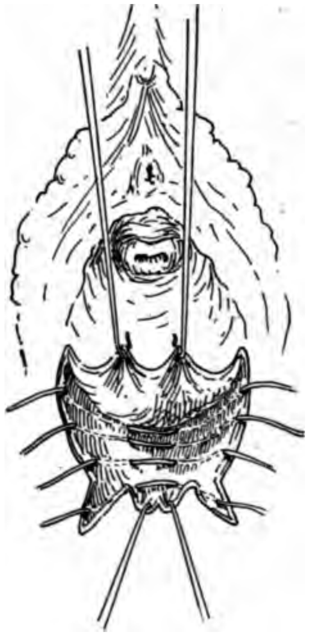


FIG. 87.—(30) TAIT PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM BY THE FLAP-SPLITTING METHOD. (c) The vaginal flap dissected up and the sutures inserted.

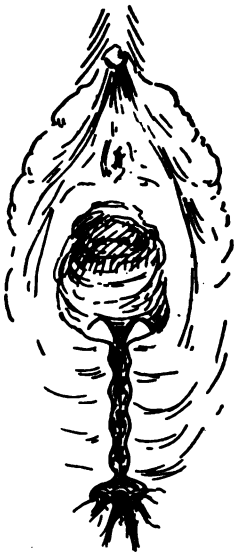


FIG. 88.—(30) TAIT PROCEDURE FOR COMPLETE LACERATION OF THE PERINEUM BY THE FLAP-SPLITTING METHOD. (d) The sutures tied with knots between the cutaneous margins.

The needle was inserted into the tissues beneath the skin, carried under the tissues to the opposite side, and brought out just beneath the cutaneous margin (Fig. 87).

(7) Several of these sutures were thus passed and then tied. The result was a gaping margin from which protruded the free ends of the silkworm gut (Fig. 88). Superficial sutures were next passed between

the free ends of the deep tissue sutures, thus carefully approximating the external margins of the wound.

(8) It should have been stated that it was Tait's custom in passing the deep tissue sutures always to make sure that he inserted one of them in such a position as to catch the retracted ends of the sphincter ani muscles, which were then brought into apposition when the sutures were tied.

(9) The sutures were generally removed on the seventh or eighth day, rarely later than the tenth.

31. RISTINE PROCEDURE FOR REPAIR OF PERINEUM AFTER COMPLETE TEAR

This consists in furnishing a flap from the posterior vaginal wall to drop down like an apron. It is, in effect, a flap-splitting operation from above rather than below, with the highly important advantage that the operation wound is thereby protected from contamination from the rectum (Fig. 89).

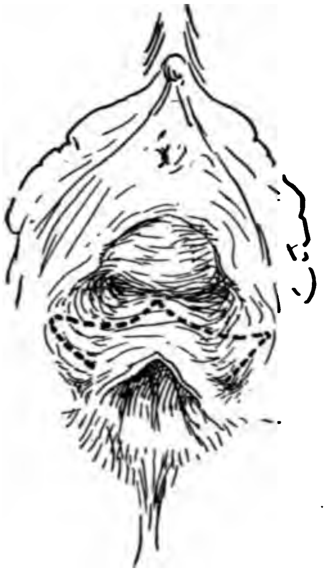


FIG. 89.—(31) RISTINE PROCEDURE FOR REPAIR OF COMPLETE LACERATION OF THE PERINEUM. An apron-like flap dissected down from above protects the operation wound from rectal contamination.

AFTER-TREATMENT OF PERINEAL OPERATIONS

The first essentials to success in this, as in other plastic operations, are rest and freedom from infection. To secure rest of the parts the patient must not only remain quiet, but distention of the parts by the passage of hardened feces, and by the incidental strainings and muscular retractions, is to be most carefully avoided. It is consequently not advisable to give more than sufficient opiates to quiet the pain following operation. In many cases even this is unnecessary. When opiates are given their constipating effect should be anticipated by the concurrent administration of small and frequently repeated doses of some saline. It is, indeed, desirable in most cases to give small doses of salines from the start, whether opiates have been given or not. The field of operation should be irrigated by some non-irritating antiseptic following each defecation and after each catheterization. Urine should be drawn exclusively by catheterization for at least the first week. If gas is bothersome, the rectal tube—the detached nozzle of a syringe—should be repeatedly inserted, and kept for several hours at a time. The parts should be carefully inspected at each irrigation, and any sign of infection about any stitch should be the signal for its removal and for the careful antiseptic irrigation of its tract. The ends of the sutures, if of silkworm or wire, should be left long, and, following each irrigation, should be wrapped with gauze saturated with normal salt solution. Sutures may be removed from the eighth to the twelfth day, according to their condition. The deep figures-of-eight may be cut and left *in situ* for twenty-four hours, when they can be withdrawn without pain. But, however prompt and complete the healing, it is of the highest importance that the patient be carefully instructed to avoid any activity that will impose extraordinary perineal activity for the next month or six weeks.

CHAPTER III

INJURIES OF THE VAGINA

RUPTURE OF THE VAGINA

Rupture of the vagina may occur at any place in the course of the canal. It is more common in the posterior than in the anterior wall. Cases have been recorded in which the rupture occurred (a) through the vault of the vagina into the cul-de-sac of Douglas; (b) through the rectovaginal septum; (c) through one fornix into the broad ligament; (d) through the anterior wall into the bladder; and (e) through the vaginal wall without communicating with any other cavity.

Rupture of the vagina is essentially an accident of parturition, although it has occurred as the result of traumatism due to other causes. The condition is to be looked upon as a tear due to the joint influence of an expansive force and to the elasticity of the canal. It may result in the formation of a fistula, but a rupture is to be distinguished from a fistula in the particular that, while a tear is caused, as already indicated, fistula is generally the result of prolonged pressure and subsequent necrotic changes.

Symptoms and Diagnosis.—Hemorrhage, sometimes profuse, is the symptom that is liable to cause early attention to the condition. Many of these lacerations pass without recognition and heal spontaneously by the formation of irregular cicatrices, which narrow the vagina in an irregular way, causing dispareunia and other distressing symptoms.

Physical examination will reveal the recent rupture generally diagonal to the axis of the canal, although it may extend in any direction. It is generally a dark contused laceration. Healed cases are recognized by the inelastic bands of cicatricial tissue in the vaginal wall.

Treatment.—The recent rupture should be cleansed and carefully closed by interrupted sutures. If old cicatricial bands cause stenosis or are a source of persistent pain and discomfort, they should be carefully dissected out and the margins of the wound thus formed carefully coapted.

VAGINAL FISTULÆ

Vaginal fistulæ, establishing connection with some other cavity or viscus, occur for the most part as the result of injury to the vagina, although, in certain cases, they occur as the result of suppuration arising outside of the vagina.

The forms of fistula met with in the female genital tract are urinary and fecal.

Urinary Fistulæ.

- Vesicovaginal.
- Urethrovaginal.
- Vesicouterine.
- Ureterovaginal.
- Ureterouterine.

Fecal Fistulæ.

- Rectoperineal.
- Rectovaginal.
- Enterovaginal.

VESICOVAGINAL FISTULÆ

Fistulous communications between the vagina and bladder (Fig. 90), while far from rare, are not so frequent as they were during the era of primitive midwifery. They may vary very much in size. At times it is so large that the mucous membrane of the bladder prolapses through it and the bladder is almost turned inside out. The mucous membrane is easily recognized by its bright red color. At other times

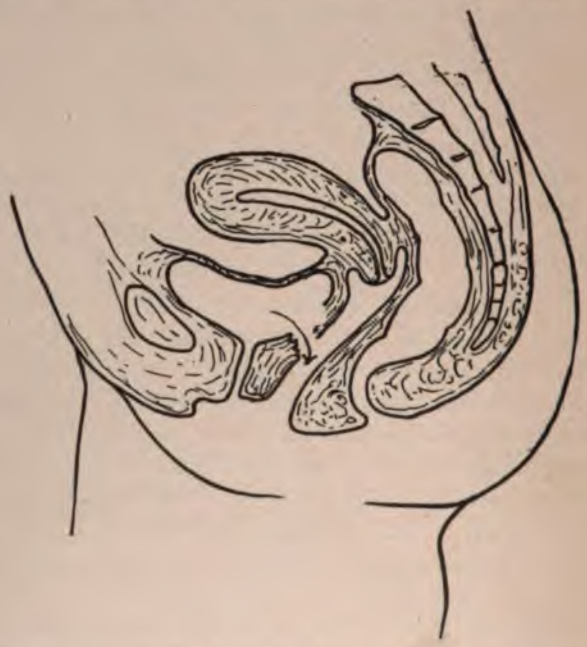


Fig. 90.—Vesicovaginal Fistula. The arrow shows the opening between the bladder and the vagina.

the fistula is only large enough to admit a small probe. The nearer to the time at which the fistula was caused the larger is the opening. The openings that are at first large gradually contract and close. It is then difficult to say how large the opening may have been originally. The cicatrix that is formed is generally thin and firm. When the urine discharges freely from the bladder after the formation of a fistula contraction of the bladder with thickening of its walls ensues. The urethra may shrink as the result of disuse. When the opening is well down the cicatricial deposits may bind its margins to adjacent structures. Such anchorages, together with the retractive tendencies of cicatricial tissue, keep the fistula open and defeat any inclination to spontaneous closure. Vesicovaginal fistula may be complicated with vesicocervical fistula (Fig. 91).

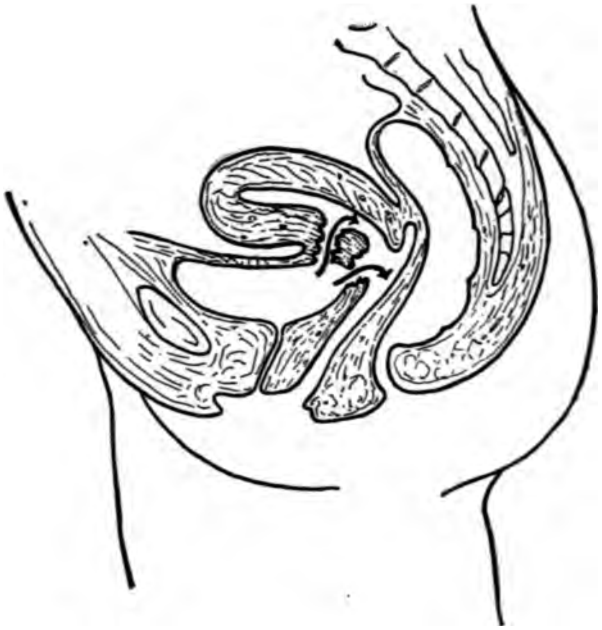


FIG. 91.—VESICOCERVICO-VAGINAL FISTULÆ. The arrows show the two openings.

Vesicovaginal fistula may result from a diversity of causes. In general terms it may be said to result from pressure, the duration rather than the intensity of which determines the injury. Sometimes the surgeon produces a fistulous opening for the relief of chronic cystitis, or for the removal of a stone from the bladder, or the bladder may be accidentally wounded during the performance of the operation of hysterectomy. Ulcerations of the bladder may occasionally produce perforation of the septum, and are sometimes a consequence of the presence of a vesical calculus.

A pelvic abscess may open in such a way as to give rise to a urinary fistula, which may be induced also by foreign bodies, such as the long-continued use of a pessary in the vagina. Injury received during labor is generally looked upon as the most frequent cause of these fistulous openings.

Such a condition may be produced by a tear through the septum, or, as is most commonly the case, a necrosis is produced by pressure during tedious delivery. Whatever may cause a difficult labor may, therefore, cause a fistulous opening between the urinary and the genital tracts. It is not necessary to dwell upon these conditions, as they are well known. Cuts that will give rise to fistulous openings may occasionally be produced by the use of instruments in accomplishing delivery. Such cuts usually occur in the lower part of the vagina. The forceps is no doubt more frequently blamed for the production of fistulous openings than it should be. It is generally used in difficult labors; that is to say, those in which there is long-continued pressure on the soft parts. We may conclude, therefore, that the fistulous openings are due to the long-continued pressure in such cases, and not to the use of the forceps. They may, indeed, be due to the non-application of the forceps.

Fistulous openings have been produced sometimes as a consequence of cuts made by splinters of fetal bones during the performance of the operation of craniotomy.

Malignant disease frequently causes fistulous openings, not only into the bladder, but also into the rectum. Nothing can be done by surgical means to alleviate the sufferings of these poor unfortunates, and such cases need not be considered here.

A calculus is frequently formed in the vagina as a consequence of the presence of a vesicovaginal fistula.

Symptoms and Diagnosis of Vesicovaginal Fistula.—Incontinence of urine per vaginam is the one symptom on which a presumptive diagnosis may be based. If the fistula is large a digital or instrumental examination will clear up all doubt. A sound introduced through the urethra can be carried through the fistula or *vice versa*. The speculum may bring the opening into plain view. In some cases the opening is so small as to defy detection of its vaginal opening. If the bladder is now filled with water stained with methylene blue, and if this stained water finds its way through the fistula into the vagina, the diagnosis may be said to be established. To make this test conclusive the vagina should be made perfectly dry and then packed with clean gauze, when, if a fistula exist, the gauze will be stained at a point corresponding to the opening. Cystoscopic examination may further confirm the diagnosis. If the urine continues to come down unstained it is probable that the fistula communicates with the ureter.

Treatment of Vesicovaginal Fistula.—The treatment is operative. It ought not to be undertaken for a period varying from one to several months after the occurrence of the fistula. In the first place certain of these fistulæ have a tendency to close spontaneously, and in the next place a certain time is required for the disappearance of the acute inflammatory infiltration of the margins of the fistula—a condition that will defeat all efforts at closure.

When the proper time arrives for operation the patient is prepared by having the bowels evacuated the day previous and the colon washed out by high enema the morning of the operation and about three hours before the patient goes to the operating room.

32. SIMS PROCEDURE FOR REPAIR OF VESICOVAGINAL FISTULA

The original operation successfully applied for the cure of vesicovaginal fistula was devised by J. Marion Sims. The successive stages of the technique are as follows, viz.:

(1) The patient is placed upon a table on her left side in the Sims position (Fig. 377).

(2) The Sims duck-bill speculum (Fig. 385) is introduced into the vagina and intrusted to an assistant, who is instructed to hold it with considerable traction, exerting the force upward and backward in the direction of the coccyx. The fistula will then be brought to view.

(3) It should at this point be inspected carefully to determine its natural lines and the consequent direction in which the lips will be approximated. Having determined this point,

(4) The margin of the fistula is seized with a volsella or long hemostatic forceps and the continuous strip of cicatricial tissue is cut away from the margin of the fistula along its entire circumference (Fig. 92), care being taken to avoid the vesical mucosa.

(5) The small amount of blood that oozes from this surface should now be carefully wiped away and the surface inspected.

(6) If at any point the surface is not deemed broad enough for the purpose of approximation and union, a little more tissue may be removed.

(7) A short, strong, slightly curved needle, loaded with a double loop of silk thread and carrying silver wire, is passed through one lip of the fistula and brought over and out through the other lip at a directly opposite point.

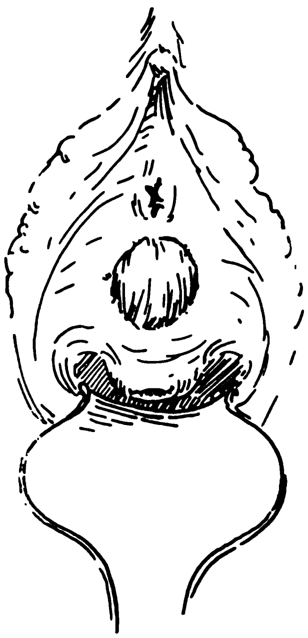


FIG. 92.

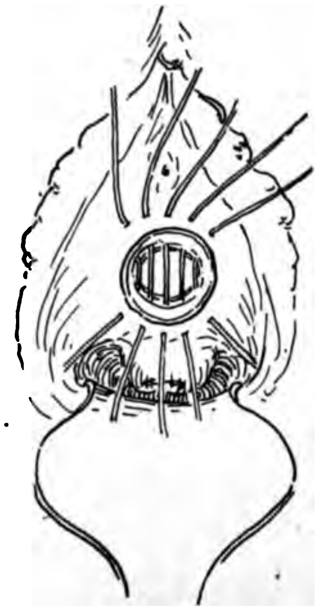


FIG. 93.

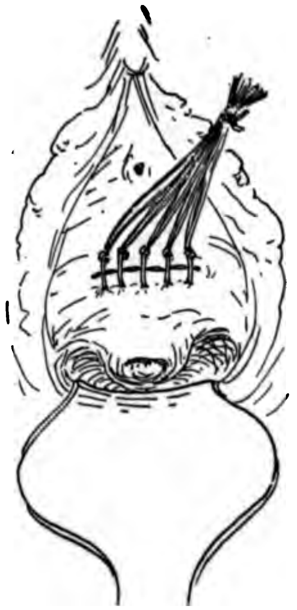


FIG. 94.

FIGS. 92–94.—(32) SIMS PROCEDURE FOR REPAIR OF VESICOVAGINAL FISTULA (after Montgomery).

FIG. 92.—(a) The protruding vesical mucous membrane.
FIG. 93.—(b) The margins of the fistula have been denuded and the sutures inserted.
FIG. 94.—(c) The sutures have been tied and the ends left long and sheaved.

(8) One after another of these sutures is passed at intervals of from three to four millimeters apart (Fig. 93). When the silver wires are all *in situ* the margins are again washed carefully and the sutures, one after another, are closed by "shouldering" the wires close to their points of emergence (Fig. 94).

(9) A sigmoid catheter with several feet of small drainage tube attached to it should be inserted and left *in situ* for several days.

(10) In absence of any indication to do so earlier, the stitches should be inspected on the tenth day, and, if found in good condition, should be left two or three days longer before being removed.

Certain of the foregoing apparently minor details should be emphasized as to their real importance. Thus, the various manipulations incident to closure should be carefully done, or the entire operation may be easily defeated. It is important, before "shouldering" the wires, to ascertain exactly the point at which they will cross. Each end should be bent by a sharp angle at that point, crossing and twisting thence outward. If they are crossed without any regard to this precaution the twisting will extend toward the field of operation and toward the distal layer of the wall. In this way a destructive tension will be brought to bear upon the tissues, the wire will cut out before union is completed, and the objects of the operation will be defeated. Silkworm gut may be employed as a suture material, although it is probable that, if the technique of Sims is to be followed, it would be better to follow it in its entirety. The operation thus concluded, the vagina is again thoroughly irrigated and a little sterile gauze is inserted for the first twenty-four hours.

Certain *modifications of technique* have been devised because, in the original operation of Sims, there are several points that are open to criticism, notwithstanding the fact that he and his immediate followers achieved great success in their operations upon this class of cases. The experience of the profession, however, has demonstrated that a modification of the technique will result in greater facility of operation and in at least equally satisfactory results. Thus, the Sims operation requires the presence of an assistant to hold the speculum. When the perineum is retracted and the atmospheric pressure is exercised upon the anterior vaginal wall the fistula drops inward and forward—the farthest possible distance away from the operator. It is necessary for him, therefore, to employ long-shanked instruments to conduct his operation. The method of denudation is one which necessarily sacrifices a greater or lesser amount of tissue from a locality where too much tissue has already been destroyed. In the event of successive operations by this method the hope of a successful issue is ultimately destroyed by the sacrifice of the septum. The author remembers to have seen a case in the Rotunda Hospital, in Dublin, in which the entire base of the bladder had been whittled away in successive efforts to close an originally small fistula.

33. AUTHOR'S PROCEDURE FOR CLOSURE OF VESICOVAGINAL FISTULA BY THE FLAP-SPLITTING METHOD (A)

(1) The patient is prepared as for the Sims operation.

(2) She is placed on the table with her knees drawn well up, and retained in that position. Mechanical devices are better, however, as injury to the hip joint has been done by the unguarded action of assistants in exercising too much pressure upon the legs.

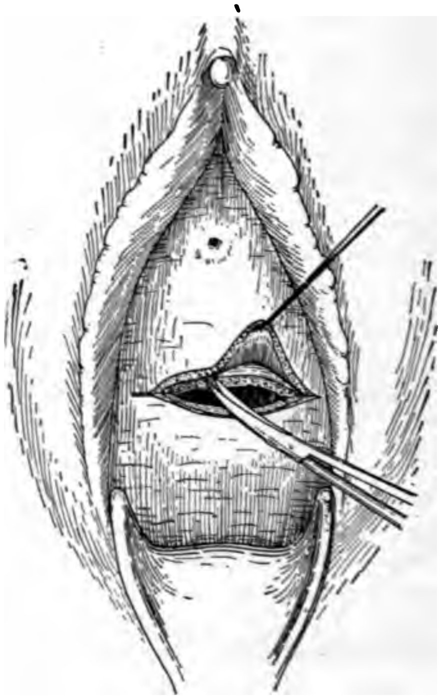


FIG. 95.—(33) AUTHOR'S PROCEDURE FOR REPAIR OF VESICOVAGINAL FISTULA BY THE FLAP-SPLITTING METHOD. (a) Method of splitting the flaps.

(3) A Jones self-retaining speculum is now inserted, by which means the fistula is brought directly into view.

(4) The line of closure having been determined, an incision is made outward from either angle, extending through the mucous membrane of the vagina (Fig. 95).

(5) The margin of the fistula is now split, either by means of the

knife or a pair of sharp-pointed scissors curved on the flat, and one blade inserted through the incision already made beneath the mucous membrane, and carried around to the incision in the opposite angle (Fig. 96).

(6) The other lip of the fistula is treated in the same way. The membrane of the vagina and that of the bladder, respectively, are by this means separated into two flaps; those in the bladder can be folded inward and approximated, while those within the vagina can be folded outward and similarly approximated by their denuded surfaces.

(7) A curved needle is now inserted just beneath the vaginal mucous membrane, made to dip deeply into the cellular layer, and brought out just beneath the vesical mucosa.

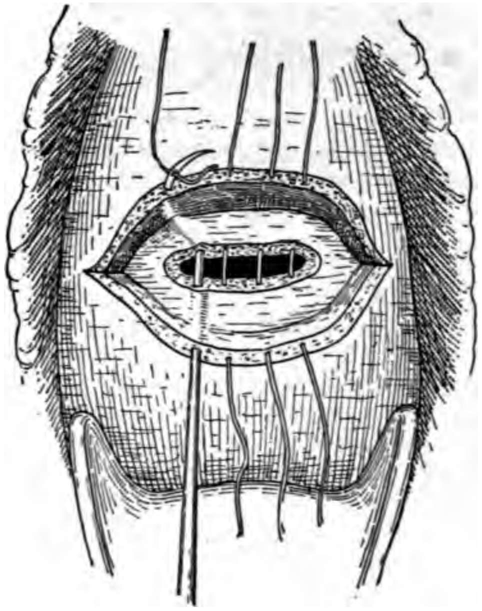


Fig. 96.—(33) Author's Procedure for Repair of Vesicovaginal Fistula by the Flap-splitting Method. (b) Method of inserting the sutures.

(8) It is then crossed over and inserted beneath the vesical mucosa, dipped deeply into the cellular layer, and brought out just beneath the vaginal mucosa.

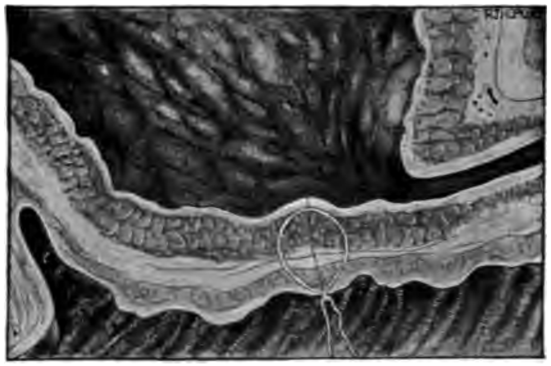


Fig. 97.—(33) Author's Procedure for Repair of Vesicovaginal Fistula by the Flap-splitting Method. (c) Increased area of approximation by the flap-splitting method.

(9) Other sutures passed in a similar way at intervals of about 5 mm. (Fig. 97) are then drawn together and tied. In this way the approximation surfaces are increased in area (Fig. 97), while by the old through-and-through sutures they are diminished in area (Fig. 98).

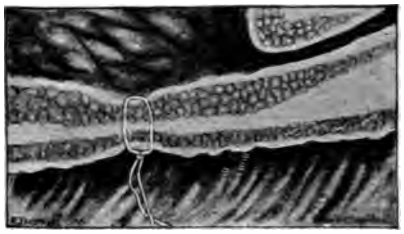


FIG. 98.—CONSTRICTED SURFACES OF APPROXIMATION BY THE OLD THROUGH-AND-THROUGH METHODS OF SUTURE IN PROCEDURE FOR REPAIR OF VESICO-VAGINAL FISTULA BY THE FLAP-SPLITTING METHOD.

(10) The sutures are removed on the eighth or tenth day.

This is generally the procedure of choice when the fistula is comparatively small and can be made accessible by downward traction. In cases of firm anchorage it is not more difficult than the original denudation operation, and offers better prospects of success.

34. AUTHOR'S PROCEDURE FOR CLOSURE OF VESICOVAGINAL FISTULA BY THE FLAP-SLIDING METHOD (B)

(1) The patient is placed on her back with her buttocks at the edge of the table.

(2) The cervix, exposed by a self-retaining speculum, is seized with traction forceps and drawn down.

(3) The anterior wall of the vagina is freely incised from the base of the bladder to the cervical juncture, the incision when practicable occupying the median line and encircling the fistula by the flap-splitting method (Fig. 99).

(4) The vaginal layer is now dissected away from the vesical layer over practically the entire presenting area of the bladder.

(5) The margins of the vaginal layers are now clipped smooth, retracted, the wall of the bladder is infolded vertically along the line corresponding to the location of the fistula, and sutured with the continuous buttonhole stitch (Fig. 100).

(6) Two or three mattress sutures are passed into, but not through, the bladder wall on one side of the closure, and brought out through the vaginal wall of the opposite side one centimeter from the margin. These mattress sutures are tied on the vaginal surface, thereby displacing the line of the vesical suture one centimeter to the side of the vaginal line of suture (Fig. 101).

(7) The vertical incision in the vaginal layer is then closed with either interrupted or continuous buttonhole suture, preferably the latter, thus leaving the underlying line of suture to one side (Fig. 102).

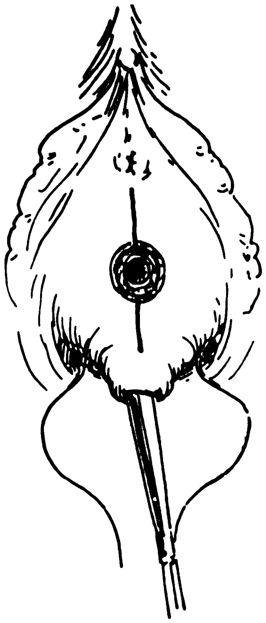


FIG. 99.—(34) AUTHOR'S PROCEDURE B FOR REPAIR OF VESICOVAGINAL FISTULÆ BY THE FLAP-SLIDING METHOD. (a) The cervix drawn down, the dark line indicating the course of the incision.

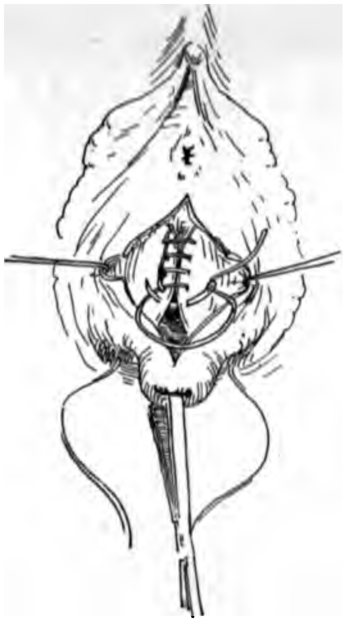


FIG. 100.—(34) AUTHOR'S PROCEDURE B FOR REPAIR OF VESICOVAGINAL FISTULÆ BY THE FLAP-SLIDING METHOD. (b) The vaginal incision trimmed straight and dissected back revealing the anterior wall of the bladder, which is being infolded and stitched to close the fistula.

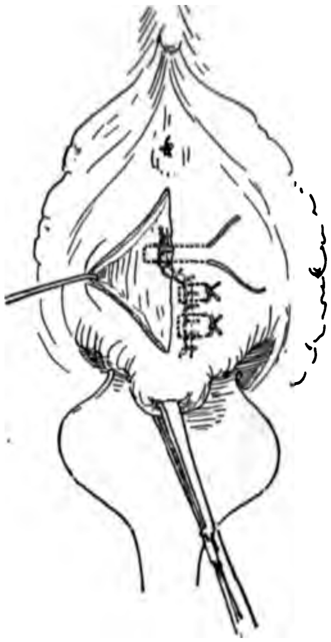


FIG. 101.—(34) AUTHOR'S PROCEDURE B FOR REPAIR OF VESICOVAGINAL FISTULÆ BY THE FLAP-SLIDING METHOD. (c) The infolding and stretching completed; three mattress sutures inserted, two of them being tied, displacing the lower end of the vesical closure 1 cm. to the right of the vaginal incision.

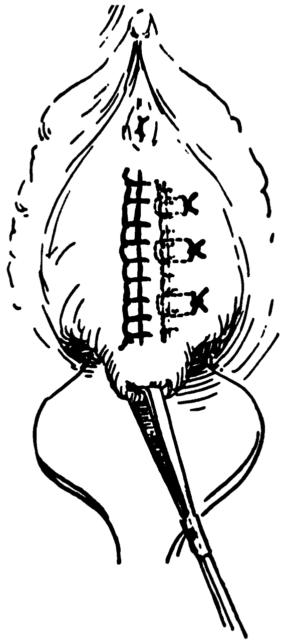


FIG. 102.—(34) AUTHOR'S PROCEDURE B FOR REPAIR OF VESICOVAGINAL FISTULÆ BY THE FLAP-SLIDING METHOD. (d) The operation completed with the line of vesical closure displaced 1 cm. to the right of the vaginal closure.

In certain large fistulæ in which the vesical margins cannot be approximated the orifice may be closed by the application of this flap-sliding principle.

This procedure is available and very desirable when the fistula is favorably situated in the septum, and when the uterus and bladder are not so anchored by adhesions that the field of operation cannot readily be brought down and thus made accessible.

35. FARGAS PROCEDURE FOR CLOSURE OF VESICOVAGINAL FISTULA WHEN LOCATED HIGH

In certain cases in which the fistula is located just in front of the cervix, and in which cicatricial bands and anchorages make other procedures unavailable, Fargas virtually plugs the opening with the cervix.

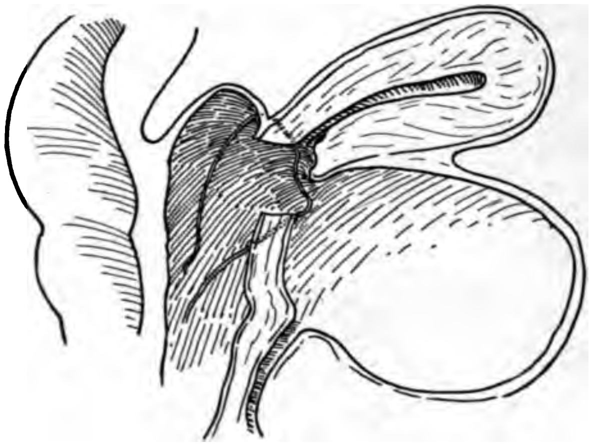


Fig. 103.—(35) Fargas Procedure for Occlusion of Vesicovaginal Fistula by Vesicocervical Anastomosis.

The details of the procedure are evident from the accompanying drawing (Fig. 103), from which it will be seen that, following the operation, the intestinal discharges are diverted through the bladder and urethra.

GENERAL MEASURES IN AFTER-TREATMENT OF OPERATION FOR VESICOVAGINAL FISTULÆ

After-treatment of operation for vesicovaginal fistulæ must be addressed to the maintenance of rest and asepsis. A self-retaining soft rubber catheter (Figs. 104, 105) should be introduced at the time of operation and kept in position for the first week. If the bladder is irrigated daily with a sterilized alkaline solution (sodium bicarbonate, 5 per cent.) concretions will not form. This irrigation should be done carefully, the solution being thrown in with a soft rubber bulbous syringe of not more than a half-ounce capacity, and not more than an ounce being thrown in at one time. This may be repeated several times at the same séance.

The vagina is irrigated twice daily with a mild antiseptic solution and the residual water is siphoned out. It is well to use a soft catheter for a syringe nozzle and thus avoid injury to the sutures. The patient is kept for the most part either in the extreme Sims position or lying upon her face, either of which favors the spontaneous drainage of the bladder through the catheter.

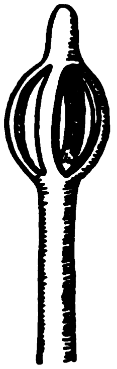


FIG. 104.

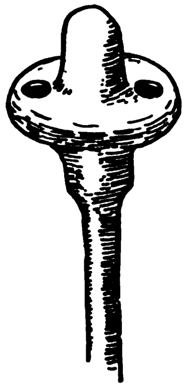


FIG. 105.

FIGS. 104 AND 105.—FORM OF TIPS FOR SELF-RETAINING SOFT RUBBER CATHETERS.

The sutures should be removed with great care, and this is best done with the patient in the Sims position. The bowels must be kept gently open by mild laxatives, and all efforts at straining must be avoided.

When the chromic catgut is used in the flap-sliding operation it does not require removal, as absorption takes place in from ten to twenty days.

URETEROVAGINAL FISTULA

It sometimes happens that a fistula is formed between the ureter and the uterus, or between the ureter and the vagina. Such fistulæ are fortunately rarely met with. They are very difficult to deal with, and at times somewhat difficult to discover.

Symptoms and Diagnosis.—Vaginal incontinence of urine is the essential symptom. The orifice is generally very small. They can be most readily discovered by means of a probe. If the probe passes on farther than the confines of the bladder it would indicate that it must be disappearing into the ureter toward the kidney on that side. We can make out the perviousness of the lower portion of the ureter by introducing a probe in the other direction toward the bladder.

Treatment.—Nephrectomy may be considered, but should only be carried out as a last resource. If the fistula can be closed by a direct method of operation this should be carried out. If it cannot be closed we must then contemplate implantation of the ureter in the bladder. Operation from the vaginal side is generally impracticable. As a rule, these conditions should be dealt with either by end-to-end anastomosis of the ureter or by implanting it in the bladder (see Injuries of the Ureter).

RECTOVAGINAL FISTULA

A fistulous opening between the rectum and vagina is a peculiarly distressing ailment, not only because of feces escaping by the vagina, but from the fact that intestinal gases pass into the vagina and escape with an audible bubbling or hissing noise, which, with the fact that the odor is perceptible to the sufferer, causes her to brood over her condition, to seclude herself from society, and to pass such a miserable existence that it may end in mental alienation unless the condition is cured.

Cancer, syphilis (see Malignant Neoplasms of the Vagina; also Syphilis), and injury are the usual causes. Pyosalpinx and other inflammatory diseases of the appendages not infrequently cause fistulæ, but these are usually rectal or vaginal, seldom rectovaginal. It may occur from the ulceration induced by the long-continued presence of a pessary, from the presence of some foreign body in the vagina or rectum, or from a stab wound, accidental or intentional. In these cases the fistula usually heals on removal of the cause, together with careful attention to the wound by mild antiseptic douches and gauze packing.

Childbirth as a cause of rectovaginal fistulæ is more frequent than the perfection of modern obstetric treatment might lead one to suppose. They not infrequently follow complete rupture of the perineum, where the rent has passed well up the rectovaginal septum, and where the primary operation has led to healing of the perineum and perhaps of the sphincter, but where there has been a failure in union of the rectal wound. These fistulæ may occur at any part of the posterior wall of the rectum, from just within the sphincter up to the highest point the finger can reach, and may vary in size from an opening admitting a No. 1 catheter to a slit admitting one, two, or three fingers. They may also follow on sloughing caused by pressure from delayed delivery, but from this cause rectovaginal is much less common than vesicovaginal fistula.

Symptoms and Diagnosis.—Fecal incontinence through the rectum is the essential symptom. The feces thus discharged are stercoraceous and are hardened unless the bowels are relaxed. Physical exploration will reveal the opening generally above the perineal triangle (Fig. 106).

Treatment.—In recent tears, or in cases in which the fistulous margins are granular, spontaneous cure may take place, only, however, if the sphincter ani muscle is divulsed, and the gas and feces are piped off through a rectal tube for a long enough time to permit the healing to take place. If the fistula is low down various methods of procedure may be adopted.

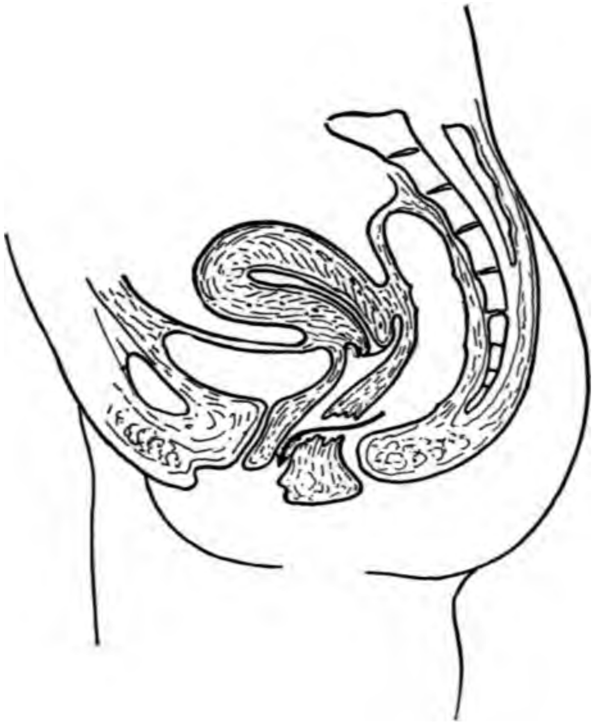


FIG. 106.—RECTOVAGINAL FISTULA. The fistula situated above the deep muscular layer of the perineum.

36. MAYO-ROBSON PROCEDURE FOR HIGH RECTOVAGINAL FISTULA

(1) The patient is placed in the lithotrity position, or on the left side, and the perineum drawn back by a retractor, so as to expose the fistula.

(2) The edges of the opening are pared by a narrow sharp knife or by means of small curved scissors.

(3) The rectovaginal septum is then split by a blunt dissector for a quarter or half an inch round the fistula, so as to make a broad raw surface without material loss of tissue, and so as to be able to bring together the rectal part and the vaginal part by separate sutures.

(4) Catgut sutures are first applied to the rectal edge of the fistula

by means of a rectangular cleft-palate needle, the sutures taking up the submucous tissue close to but not including the mucous membrane, and being placed sufficiently close to occlude the rectal opening.

(5) These sutures, being applied from the vaginal surface, are tied, cut off short, and buried by

(6) The next row of sutures, which may be of chromicized catgut or of silk or silkworm gut.

(7) If catgut is employed the stitches may be buried; if silk or silkworm gut is used the sutures must be tied on the vaginal surface and removed in about ten days.

(8) If the vagina is contracted it may be found easier to repair the rectal edges of the fistula from the bowel surface, using a Sims speculum through the well-stretched anus.

37. MAYO-ROBSON PROCEDURE FOR LOW RECTOVAGINAL FISTULA

If the fistula is fairly low, say within 2 or 3 cm. of the anus, Mayo-Robson finds it best

(1) To lay the whole fistula open by cutting through the tissues (including the perineum or its remains) intervening between it and the surface. This he does by one sweep of a probe-pointed bistoury or by means of scissors (Fig. 107), the vagina being thus made continuous with the rectum, thus converting the condition into one of complete laceration of the perineum.

(2) The assistants or nurses, standing one on each side, place a hand on the skin over each tuber ischii and retract gently, converting the H-shaped gap into a transverse wound, as shown in the illustration.

(3) Pointed scissors are then employed to open up the rectovaginal septum so as to convert the narrow edge into a raw surface.

(4) Slits are then made on each side straight forward for about an inch, as in Tait's operation for perineorrhaphy.

(5) The angles being drawn forward by catch forceps, chromicized catgut sutures are inserted in the margins of the vaginal mucous membrane, so as to approximate them and thus form the vaginal floor by closing the V-shaped slit.

(6) In the same way chromicized catgut sutures are inserted in the margins of the rectal mucous membrane, so as to form the anterior rectal wall by closing the V-shaped slit in the rectum (Fig. 108); these sutures are cut off short.

(7) We now have a large rectangular raw surface which can be rapidly closed by four or six silkworm gut sutures entering on one side at the skin margin to the other (Fig. 109).

Before drawing tight the last series of sutures the wound is bathed

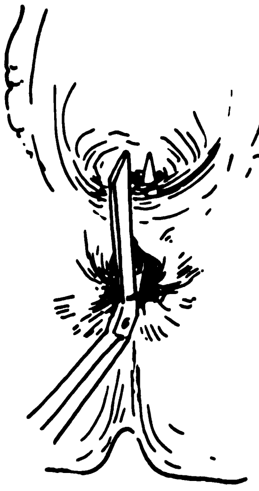


Fig. 107.

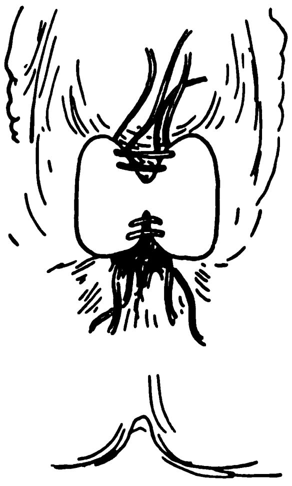


Fig. 108.

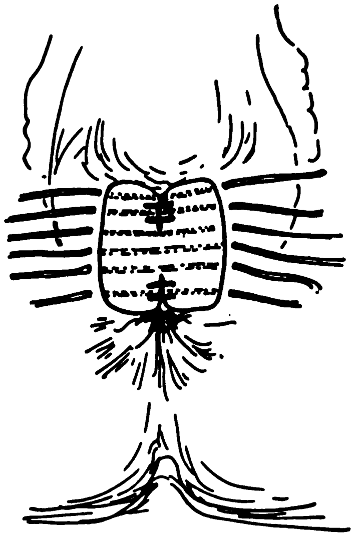


Fig. 109.

Figs. 107–109.—(37) Mayo-Robson Procedure for Repair of Rectovaginal Fistula.
Fig. 107.—(a) The cutaneous septum is divided by a single cut by the scissors.
Fig. 108.—(b) The vaginal and rectal margins are sutured separately.
Fig. 109.—(c) The transverse sutures are inserted deeply under all surfaces to be approximated.

with a 1 in 2,000 solution of perchlorid of mercury. No vessels are ligated. When the final sutures are tied the parts look perfectly normal and no raw surface can be seen. The bowels are moved daily after the second day by a plain water enema, and the vagina is washed out daily with boric lotion. No catheter is employed if it can be avoided, and, as a rule, its use is not necessary. The parts are dressed with iodoform gauze, over which wool and a T-bandage are applied. The sutures are removed about the tenth day, and the patient is allowed to be up about the fourteenth.

38. PROCEDURE FOR CLOSURE OF RECTOVAGINAL FISTULA BY THE FLAP-SPLITTING METHOD

The author has found the flap-sliding operation devised for the repair of vesicovaginal fistulæ equally eligible for repair of rectovaginal fistulæ. (For details of technique see Vesicovaginal Fistula.)

In this as in all other procedures for the repair of rectovaginal fistula the sphincter-ani muscle should be divulsed to the point of temporary paralysis at the time of operation. When it has regained its tone a soft rubber rectal tube should be worn for a week.

ENTEROVAGINAL FISTULA

Fistulæ between the small intestines and the vagina are of rare occurrence. They may be the result of extensive suppuration within the pelvis, generally originating in the Fallopian tubes and finding an outlet through both the bowel and the vagina. The author has had only two cases of this kind. The most common cause is panhysterectomy, especially vaginal hysterectomy, in which the upper end of the vagina is left open. When it does occur as a post-operative complication it is generally as a spontaneous relief of an inflammatory volvulus induced by adhesion of the bowel to the raw margin of the incision. The ileum is generally the segment of the canal involved in these complications.

Symptoms and Diagnosis.—The essential symptom is fecal discharge through the vagina. Fecal discharge derived from the small intestine is always thin, abounds in bile, and is but slightly, if at all, stercoraceous. The opening, which may be small, is always found in the upper end of the vagina. The previous history of the case will throw much light on the probable complications within the pelvis.

Treatment is exclusively surgical.

39. PROCEDURE FOR REPAIR OF ENTEROVAGINAL FISTULA

(1) Pack the vagina firmly to force the uterus, or the vault of the vagina, as high as possible in the pelvis.

(2) Place the patient in the Trendelenburg position.

(3) Open the abdomen with a free incision in the median line extending from just above the pubes half way to the umbilicus.

(4) Find the enterovaginal adhesion, separate it, and bring the loop of intestine into the field of operation.

(5) Strip the intestine and place either a heavy silk thread or a tape around it two inches above and two inches below the opening.

(6) Treat the intestine by any one of the following methods: (a) if the opening is very small, close it with a purse-string suture, and stitch the peritoneum across; (b) if larger, and surrounded with a peritoneal ring, cut out the ring, nick the wall above and below and stitch by infolding; (c) if the opening is too large, or if the damage done by separating the bowel from its adhesion is too extensive to permit of repair by the preceding methods, the bowel should be resected and a lateral anastomosis effected.

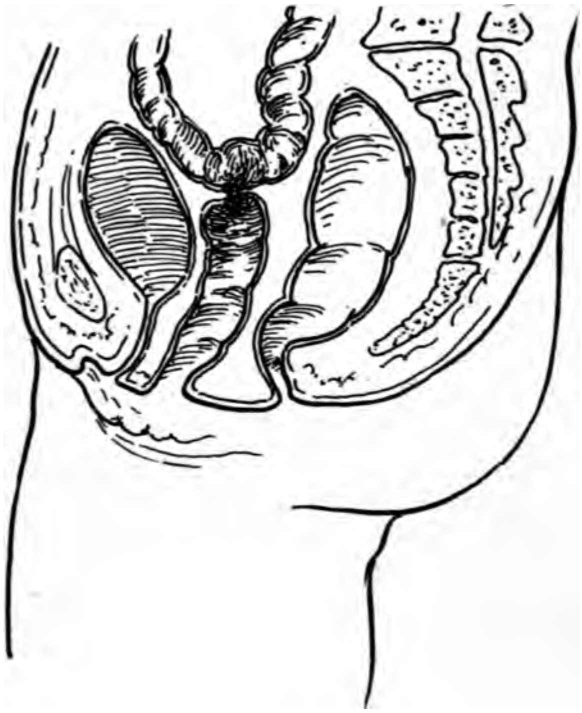


Fig. 110.—Enterovaginal Fistula. A fistula between a loop of ileum and the vagina following panhysterectomy.

(7) If convenient the vaginal opening may be infolded and closed from the inside by chromic gut suture; if not it may be disregarded.

(8) The tapes are now removed from the intestines and the operation completed by closure of the abdominal wall.

It is important to remember that in the infolding operation care must be taken not to produce obstructive angulation of the bowel.

URETHROVAGINAL FISTULA

Urethrovaginal fistulæ may result from pressure incident to childbirth, from erosive ulceration, as in *Spirochæta pallida* infection (syphilis), or from violence due to reckless instrumentation. The opening may be at any point in the urethra.

Symptoms and Diagnosis.—The leading symptom is the escape of some or all of the urine through the vagina. The patient generally has otherwise complete control. When, however, the urine is voluntarily voided the misdirected spray-like discharge is very distressing and is liable to result in excoriations. Physical examination with the catheter or sound will reveal the opening.

Treatment is exclusively surgical.

40. PROCEDURE FOR THE CLOSURE OF URETHROVAGINAL FISTULA

(1) The patient is placed in the dorsal position.

(2) A male urethral sound is passed through the urethra into the bladder and intrusted to an assistant.

(3) A straight incision, extending practically the whole length of the urethra, is made vertically along the side of the fistula.

(4) A somewhat crescentic incision, the same length as the other incision, is now made on the opposite side of the fistula (Fig. 111).

(5) The semicrescentic piece of the vaginal membrane is now dissected away, leaving the margins of the fistula and part of the urethra quite denuded.

(6) The flap with the crescentic edge is now dissected back, exposing the urethra for the entire length of the incision.

(7) If the fistula is not large, and if the ring of the cicatricial tissue is tense, it should (*a*) be nicked above and below or (*b*) entirely dissected out, provided the latter can be done without removing enough tissue to prevent approximation.

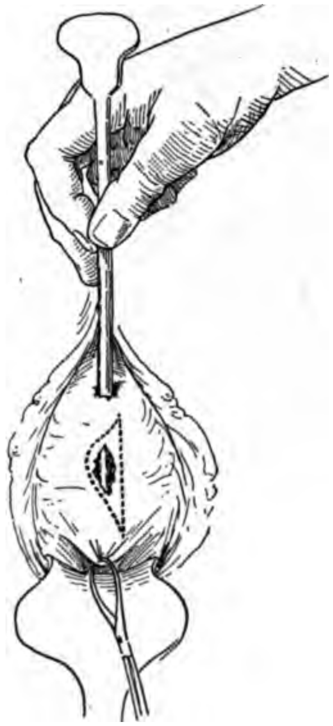


FIG. 111.—(40) PROCEDURE FOR CLOSURE OF URETHROVAGINAL FISTULA. (a) The lines of incision.

(8) The fistula may now be slightly infolded and stitched with a continuous suture of very fine chromicized catgut (Fig. 112).

(9) The crescentic-edged flap is now drawn over the urethra and stitched with interrupted sutures to the flap on the other side (Fig. 113), leaving the urethral line of closure thoroughly protected.

(10) The sound is now removed and a self-retaining soft rubber catheter, with mushroom tip, is introduced in its stead.

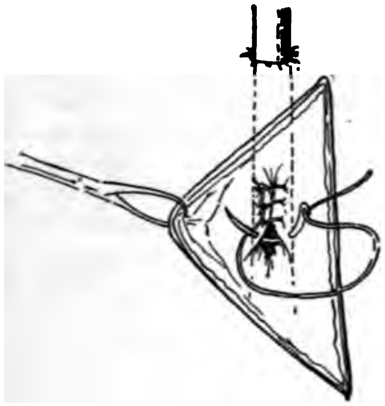


FIG. 112.—(40) PROCEDURE FOR CLOSURE OF URETHROVAGINAL FISTULA. (b) The disc of vaginal membrane around the mouth of the fistula has been cut away, the vaginal membrane dissected back and retracted and the urethral wall fortified by connective tissue is being infolded and stitched.

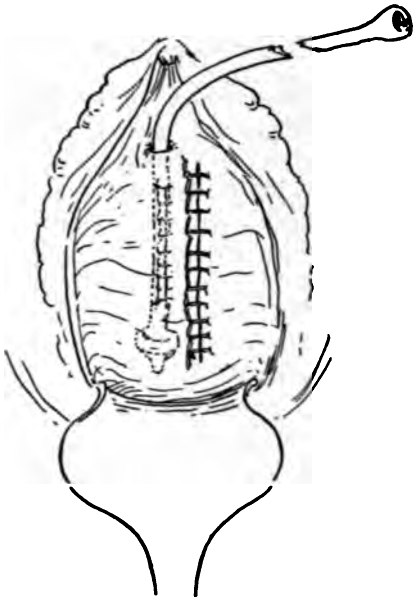


FIG. 113.—(40) PROCEDURE FOR CLOSURE OF URETHROVAGINAL FISTULA. (c) The right vaginal flap is drawn across the urethra and stitched to the vaginal flap on the left side.

If the fistula is too large to be safely infolded, or if by so doing the lumen of the canal will be made too narrow, the fistula in the deep layer may be left open and the orifice be closed by covering it with the transplanted flap.

The catheter should be worn for ten days, being kept clean by daily irrigation with a sterilized five per cent. solution of sodium bicarbonate in water.

CHAPTER IV

INJURIES OF THE UTERUS

LACERATIONS OF THE CERVIX UTERI

Lacerations of the cervix are essentially accidents of parturition. They are occasionally encountered as the results of forcible dilatation of the uterus, undertaken in most instances in connection with curettage of the uterus. When dilatation of the cervix is performed with too much rapidity and by one of the powerful instruments now in use the divulsion may result not merely in the separation of submucous fibers, but even in a complete severance of continuity of the cervical tissue. It may be said that laceration of the cervix, when occurring as the result of forcible dilatation or of parturition, is always caused by divulsion carried to a point beyond the resistant power of the cervical structures.

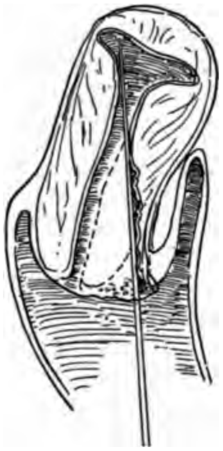


FIG. 114.—LACERATION OF THE CERVIX, BOTH SIDES, WITH EVERSION OF BOTH LIPS (ECTROPION) AND HYPERTROPHY OF THE FOLLICLES. (After Emmet.)

Lacerations of the cervix may be either superficial or deep, extending as far up as the cervicocorporeal junction, and are in reality but examples of rupture of the uterus, the damage occurring in the lower segment of that organ and involving the cervical margin. More than one rupture of this kind may occur at the same time, occasioning what is spoken of as multiple or stellate laceration of the cervix. When lacerations occur chiefly within the cervical canal, but do not extend entirely through to the lateral vaginal surfaces of the cervix, they may result in a permanent enlargement of that canal (Fig. 114).

The real significance of lacerations of the cervix, to which attention was first called by Emmet, relates to both antecedent and subsequent changes. The antecedent changes consist of those modifications of the cervical structure—e.g., fatty degeneration and edema—occurring during the course of pregnancy, which result in a loss of the normal elasticity of the tissues. The subsequent changes relate to those interferences with involution and those modifications of local nutrition which are caused by the tear and the consequent interference with the circulation. They relate, also, to the demonstrated tendency of old lacerations to become the seat of primary carcinoma.

Laceration of the cervix rarely, if ever, heals spontaneously. Repair occurs by process of cicatrization; the tissue thus formed subsequently contracts, and the underlying cervical structures are distorted. When the laceration is bilateral the resulting contraction of the cicatricial tissue causes a retraction outward of the cervical lips, with consequent eversion of the mucous membrane. The mucous membrane itself, exposed on the everted surfaces of the cervix, presently undergoes glandular hypertrophy, giving to the unpracticed eye the appearance of ulceration, and abounding in granulations (Fig. 115). There is no doubt that many of the so-called "ulcerations of the womb," treated in the years gone by with repeated applications of lunar caustic, were in reality but eversions of the endocervix in a state of glandular hypertrophy. The enlarged follicles of the cervical mucosa manifest an augmentation of function corresponding with their abnormal development; and, as a consequence, the cervix is always covered in such cases with a clear viscid mucus, sometimes tinged with blood. Changes in the parenchyma of the cervix are equally marked, and may present two extremes, namely, atrophy or hyperplasia. When the laceration is comparatively superficial the resulting inflammation goes through all the consecutive stages, from preliminary engorgement to final atrophy; but, when the laceration is deep and the consequent cervical eversion is pronounced, there is so much mechanical interference with the circulation, particularly upon the venous side, that passive engorgement ensues, resulting finally in an actual increase of the tissue elements. This state of hypertrophy is sometimes associated with edematous infiltration; but, as a rule, there occurs an organization of the adventitious tissue elements with consequent enlargement and induration of the cervix. These changes may be more pronounced in some parts of the cervix than in others, the difference being determined by the location, depth, and consequent in-

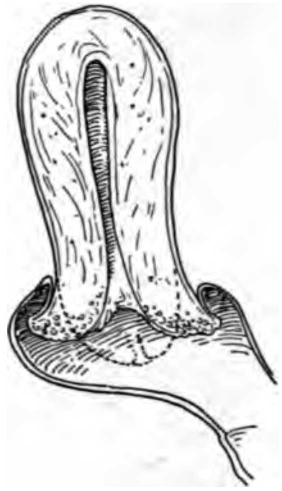


FIG. 115.—LACERATION OF THE CERVIX, ONE SIDE, WITH EVERSION OF ONE LIP OF THE CERVIX AND HYPERTROPHY OF THE GLANDS. (After Emmet.)

fluence of the laceration. The body and fundus of the uterus being largely supplied with blood by the ovarian artery, and being drained by the ovarian veins, are not subject to the influences arising from the injury of the cervix. It is noticeable, however, notwithstanding the fact that the upper zones of the uterus possess a practically independent circulation, that they undergo the post-parturient involutional changes tardily in the presence of deep injuries of the cervix. Glandular hypertrophies are not uncommon in these cases.

Among the pathologic changes dependent upon long-standing lacerations of the cervix may be mentioned atrophies, hypertrophies, or hyperplasias of both the parenchyma and endometrium. As already indicated when considering the pathology of this lesion, bacterial infection of the laceration takes place at the time of its occurrence; progressive invasion, either of the continuous mucous surfaces or of the opened lymph spaces, ensues, the result being either infection and enlargement of the pelvic lymphatic glands, with possible resulting suppuration, or infection with purulent accumulation in the Fallopian tubes, involving the ovaries in the general pathologic processes. These complications are frequently encountered and are directly traceable to the original injury for their causation. It not infrequently happens that laceration is not detected until an examination is demanded for symptoms of carcinoma. This disease, indeed, exists as a frequent complication of laceration, the carcinomatous process in many instances having its origin in the cicatricial covering of a cervical tear. Fibroids and other neoplasms may coexist with laceration of the cervix.

Symptoms and Diagnosis.—The absence of all symptoms indicating laceration of the cervix at the time of its occurrence accounts for the fact that the majority of these accidents are not discovered until long after their occurrence, when the patient presents herself for treatment for vague and indefinite pelvic symptoms. In occasional instances, however, the laceration is so deep that persistent hemorrhage results. This symptom is often overlooked for a time under the impression that the flow of blood is nothing more or less than that which occurs in normal cases following delivery. When, however, this hemorrhage persists for a considerable time, imparting an arterial tinge to the otherwise dull-colored lochia, it becomes the occasion for a local examination. Digital exploration at this time, particularly if done by an inexperienced operator, is liable to be negative, if not misleading, in its results. The cervix during the first few days following delivery is enlarged, dilated, edematous, and flabby; its normal contour may not be detected, while superficial abrasions, or even deep lacerations, may not be distinguished by the touch. Under these circumstances the patient should be placed in the Sims position, the perineum should be retracted, and the cervix should be drawn down and carefully inspected, when the bleeding point, if within the area of a laceration, can be detected and controlled.

In the later stages of a laceration—i. e., several weeks or months after the delivery—there is vastly less difficulty in detecting the actual conditions. The patient may or may not complain of pain. Cicatricial deposits, particularly in the angle of laceration, and especially in cases of long standing, may impinge upon terminal nerve filaments and occasion severe distress, and that not only in the uterus; for, through its intimate nerve connections with both the sympathetic and cerebrospinal systems, this relatively slight local injury may cause a widespread perturbation of nerve function. It would seem in certain cases as if the cervix under these circumstances were a sort of central telegraphic office, with radiating lines over which morbific impulses are telegraphed to the remotest parts of the system. Erratic behavior of the apparatus of accommodation, eccentric disturbances of hearing, evanescent or persistent turgescences of the turbinates, congestions of the Schneiderian membrane, asthmatic disturbances, localized variations of cutaneous sensibility, and that congeries of nerve perturbations designated as hysteria have been known to follow in the wake of this accident and to have been cured by repair of the cervix. These so-called reflex symptoms, however, never occur with that degree of constancy necessary for them to be accepted as indications of an existing laceration of the cervix. It may be said, in short, that there are no symptoms of a subjective character that are pathognomonic of this condition.

Local examination alone reveals the condition, which has existed possibly for years without being suspected either by the patient or her medical adviser. Introduction of the finger into the vagina will reveal the cervix with an irregular contour; it may be multilobular, each lobule being divided by a distinct fissure (stellate laceration), or it may be divided into an anterior and a posterior lip (bilateral laceration), or it may be fissured upon only one side (single laceration). If examined by the speculum these appearances may be much modified; as, for instance, if a bivalve speculum is employed, its dilation will result in stretching farther apart the anteroposterior lip of the cervix in a bilateral laceration; indeed, in cases of long standing, in which the eversion has become pronounced, the retracted lips may have been drawn up to the uterovaginal junction, and, when distended by means of a bivalve speculum, the marginal contour of the cervix may entirely disappear. The picture presented in the speculum will be that of a double elliptical area of apparent erosion. This will be nothing more or less, in practically every case, than the hypertrophic endocervium. If, now, this patient is placed in the Sims posture, the perineum retracted, and the retractor intrusted to an assistant, the examiner may, by means of a volsella placed in the apex of each lip, draw the severed portions of the cervix into approximation. He will thus be enabled to determine the depth and other exact characters of the laceration.

Treatment.—The curative treatment of lacerations of the cervix is necessarily surgical. Palliative treatment addressed chiefly to the consequences of the accident is, however, not without importance. Rest in bed, hot-water douches, frequent and prolonged tampons used with some antiseptic and exosmotic medicament, such as ichthyol and glycerin, and mild laxatives with a reconstructive diet are means of correcting many conditions dependent upon laceration of the cervix. When this treatment is all through with, however, the laceration remains to rekindle and perpetuate the mischief. A course of treatment of the kind indicated should, therefore, when necessary, be employed as a preliminary to the operation.

41. EMMET PROCEDURE FOR REPAIR OF LACERATED CERVIX

The original operation as devised by Emmet was carried out as follows:

(1) The patient is placed either upon her back or side (Sims position), as may be found most convenient, and the cervix drawn down.

(2) The flaps are brought into apposition by a double tenaculum to determine the outlines of the operation.

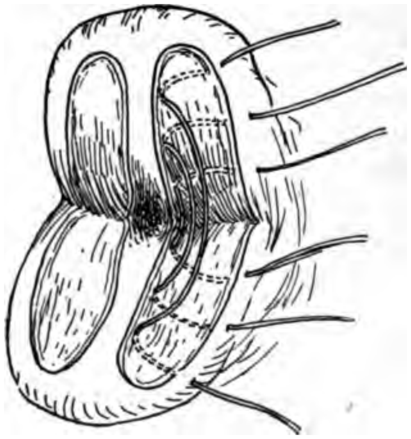


FIG. 116.

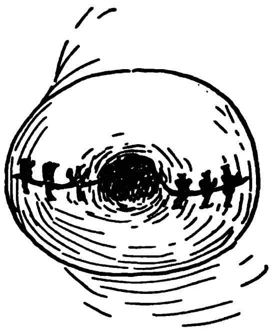


FIG. 117.

FIGS. 116–117.—(41) EMMET PROCEDURE FOR REPAIR OF LACERATION OF THE CERVIX.

FIG. 116.—(a) Area of denudation and method of suturing. (After Emmet).
FIG. 117.—(b) The operation completed. (After Emmet).

(3) The cicatricial tissue on either side of the cervical canal is to be removed by scissors from the tip of one lip to the tip of the other, care being taken to remove the triangular plug of cicatricial tissue from the angle of the tear.

(4) All troublesome hemorrhages to be controlled; the circular artery, if wounded, should be controlled by deep *en masse* ligature.

(5) With a needle holder a needle loaded with silk, and this in turn with silver wire, is passed in through one lip and out through the other, near the angle of the laceration. This process is repeated on the same side until enough of the wire sutures have been introduced to secure apposition. This same process is repeated on the other side (Fig. 116).

(6) The lips are then again approximated by the double volsellum and sutures sharply shouldered at their points of exit are twisted, care being taken to avoid necrotizing pressure upon the tissues (Fig. 117).

(7) The sutures are not removed until after the tenth day.

The preceding is the typical technique for the repair of bilateral laceration as practiced by Emmet. Its details must obviously be modified to meet the requirements of different types of laceration.

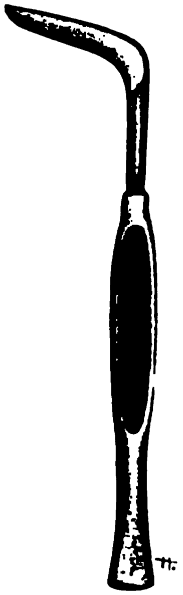


FIG. 118.—KNIFE DEVISED BY NEWMAN.

Newman has devised an ingenious knife for paring the lips. I have found it very convenient (Fig. 118).

42. AUVARD PROCEDURE FOR THE REPAIR OF THE LACERATED CERVIX

(1) The patient is placed upon her back and the uterus is brought down.

(2) The cervical lips are cut away by making a groove on either side of the cervical canal, thus making two split flaps (Fig. 119).

(3) Sutures are now placed as follows: (a) two through the two halves of the split flap anteriorly; (b) two through the posterior split flap; (c) two or three anteroposteriorly to the right of the cervical canal; (d) two or three to the left of the cervical canal (Fig. 120).

(4) The sutures are now tied (Fig. 121).

This procedure is available in the presence of hypertrophy, indicated in Fig. 115. A similarly hypertrophied lip on the other side has been cut away, and one of the anteroposterior sutures for that side has been inserted. This technique can be employed for amputation of the cervix for any cause.

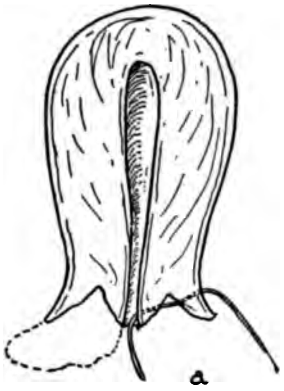


FIG. 119

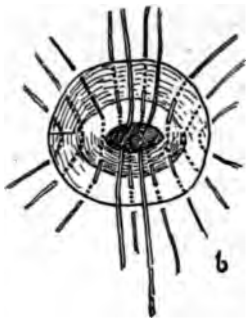


FIG. 120.

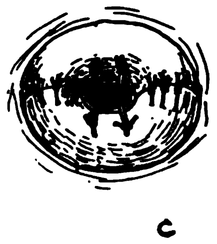


FIG. 121

FIGS. 119–121.—(42) AUVARD PROCEDURE FOR REPAIR OF LACERATED CERVIX.
FIG. 119.—(a) Method of denudation and insertion of suture.
FIG. 120.—(b) All sutures inserted.
FIG. 121.—(c) All sutures tied.

43. SCHROEDER PROCEDURE FOR LACERATED CERVIX

This is designated the simple flap operation.

(1) The cervical tissue is cut away by the removal of a conical-shaped piece down to the base of the everted area (Fig. 122).

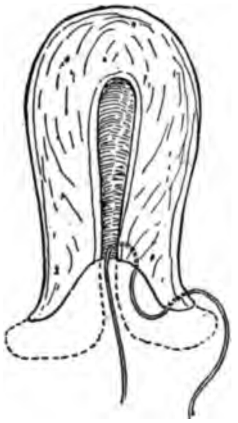


FIG. 122.

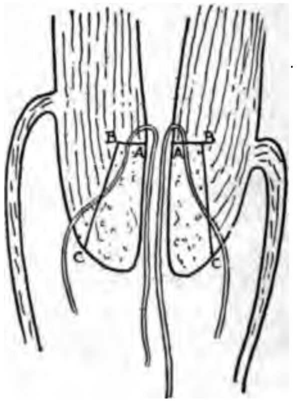
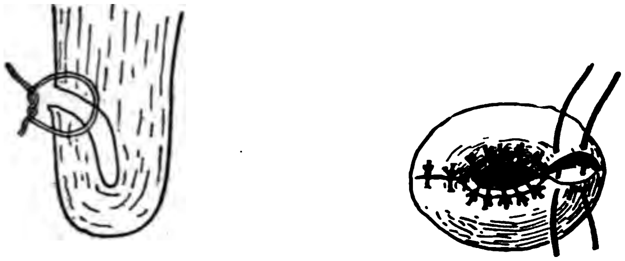


FIG. 123.

FIGS. 122 AND 123.—(43) SCHROEDER PROCEDURE FOR REPAIR OF LACERATED CERVIX.
FIG. 122.—(a) Method of denudation and insertion of sutures.
FIG. 123.—(b) Sutures tied. (After Montgomery.)

(2) Sutures are inserted on each side through the tip of each flap and the corresponding internal margin of cervical tissue (Fig. 123).



(a) (b)

FIG. 124.—FOURNIER PROCEDURE FOR REPAIR OF LACERATED CERVIX. (a) Denudation and adjustment of suture. (After Bonney and Petit.) The infolded lip and the suture tied in the cervical canal, the same in principle as the Schroeder procedure (*q. v.*).

(3) Lateral sutures are now inserted on either side of the cervical opening and tied (Fig. 124).

This procedure, like Auvard's, is available for hypertrophy of one or both lips, and can be employed for amputation of the cervix for any cause.

VESICOCERVICAL FISTULA

Vesicocervical fistula is the result of (a) prolonged pressure exercised by pinching the anterior cervical wall between the descending head and the pubes, and (b) by tearing the abnormally inelastic cervicovesical septum by pressure exercised by the descending fetus. The resulting fistula may communicate directly with the uterine or, more properly, the cervical cavity (Fig. 125), or it may be deflected downward through the cervical tissues, thus communicating directly with the vagina (Fig. 126).

Symptoms and Diagnosis.—The essential symptom is urinary incontinence, the urine escaping through the vagina. Careful inspection of the cervix through the speculum for a few minutes will reveal the urine escaping either from the cervical canal or from an orifice in the presenting edge of the cervical wall. This may be confirmed by distending the bladder with water stained with methylene blue. Further examination is not necessary, although curiosity may be satisfied by passing a sound through the fistula, or by inspecting its vesical orifice by cystoscopic examination.

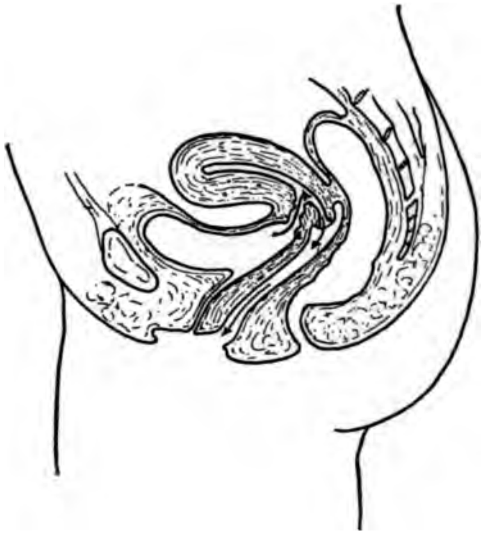


FIG. 125.—VESICOUTERINE FISTULA.

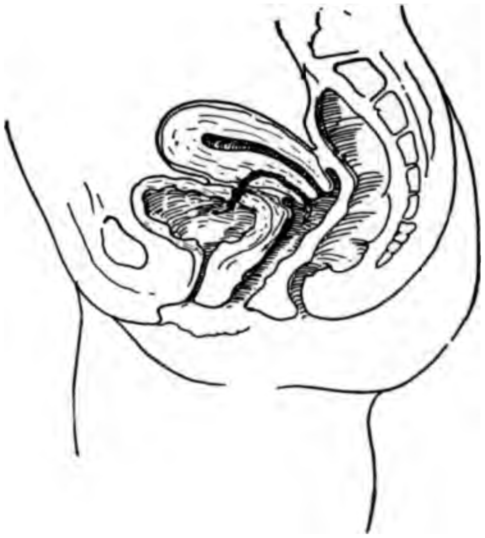


FIG. 126.—VESICOCERVICAL FISTULA.

44. PROCEDURE FOR THE REPAIR OF VESICOCERVICAL FISTULA

(1) The uterus is drawn well down to the vaginal orifice and a traction forceps inserted in the vesical wall near the cervical juncture.

(2) A transverse incision is then made through the vaginal wall at the vesicocervical juncture, and the bladder is separated from the uterus up to, but not through, the peritoneum (Fig. 127).

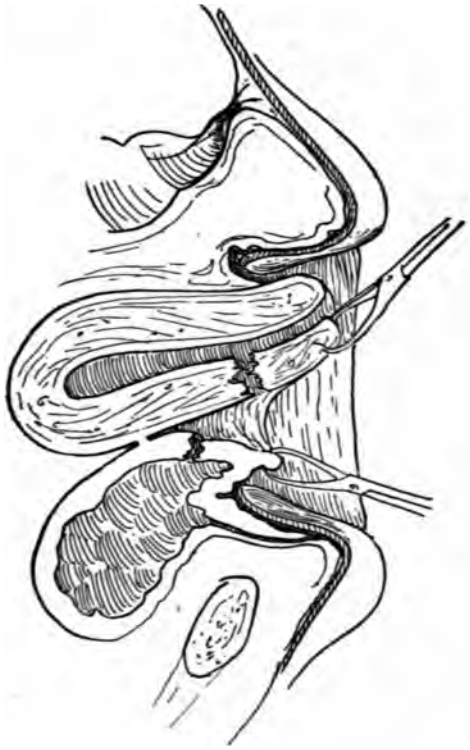


Fig. 127.—(44) Procedure for Repair of Vesicouterine Fistula. (a) Dissection for exposing the fistula.

(3) The raw surfaces are now everted, the vesical and cervical fistulæ are now closed by interrupted sutures, and a single high approximation suture is inserted above the vesical closure and below the cervical closure. This suture, when tied, will give to the approximated surfaces a flap-sliding effect, with the closed cervical fistula above and the closed vesical fistula below the suture (Fig. 128).

(4) The high approximation suture is tied (Fig. 129), and the external wound is closed by interrupted sutures (Fig. 130).

(5) A soft mushroom-tipped catheter is inserted and worn for a week.

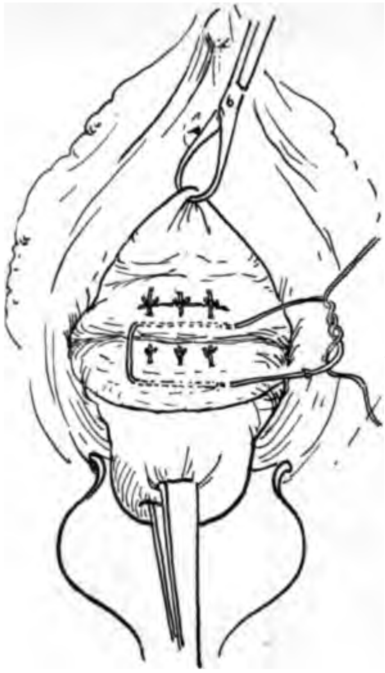


FIG. 128.—(44) PROCEDURE FOR REPAIR OF VESICOUTERINE FISTULA. (b) The fistula in both the bladder and the uterus has been sutured and an approximation suture has been inserted above the vaginal fistula, and below the uterine fistula.

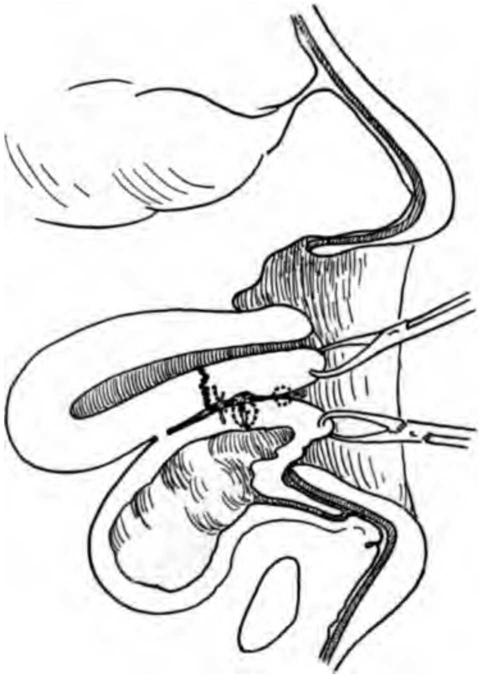


FIG. 129.—(44) PROCEDURE FOR REPAIR OF VESICOUTERINE FISTULA. (c) The approximation suture when tied separates the two fistulæ and destroys the continuity of the canal

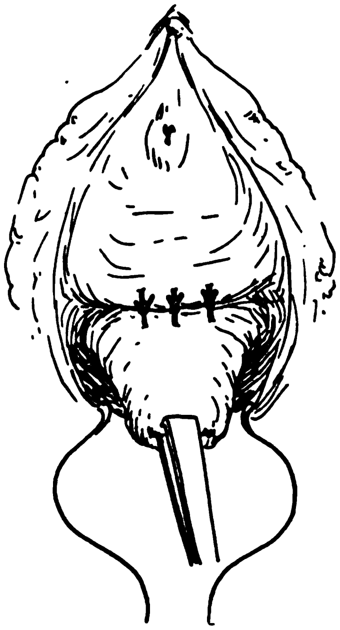


FIG. 130.—(44) PROCEDURE FOR REPAIR OF VESICOUTERINE FISTULA. (d) The incision in the cervicovesical septum is closed by interrupted sutures.

PENETRATING WOUNDS OF THE UTERUS

Penetrating wounds of the uterus, in which the injury was inflicted from without or through the abdominal wall, have generally been confined to the uterus in the state of advanced pregnancy.

Cattle-horn wounds of the uterus are of occasional occurrence in the cattle-raising districts of the world. A number of these cases have been reported, describing accidents with revolting details, but attended with a singularly slight mortality. These injuries, considered as abdominal wounds, may or may not involve the uterus; the latter class need not be considered in this connection. Of the former it may be said that they divide themselves naturally into those wounds which involve the uterine wall alone, and those which involve both the uterus and the child. The prospect of the child living under these circumstances depends, naturally enough, upon the stage of pregnancy and the degree of injury sustained by the child. Occasionally the rent in the uterine wall is so great that the fetus and secundines escape into the abdominal cavity; and even under these circumstances a viable child has been known to survive. Harris collected the histories of nine cases of this character, with a mortality of four women and four children.

Cases are on record in which a similar accident has occurred by having the patient thrown upon a sharp paling or other spear-like object. Ashton states that the pregnant uterus has been mistaken for a cyst and a trocar plunged into it at the time of doing an abdominal section. Kelly emphasizes the liability of the uterus to injury during operations within the abdominal and pelvic cavities.

Gunshot wounds of the uterus, particularly when pregnant, are recorded. Benbrook relates an interesting case of this sort, in which a 44-caliber pistol ball passed in just below the crest of the ilium, going downward and backward, and a second one entered the abdominal cavity from a point between the eighth and ninth ribs. Three days later the woman was taken with hemorrhage from the uterus, associated with labor pains, and resulting in the expulsion of a quantity of blood clot together with a bullet, which had passed into the cavity of the uterus through the fundus. Another case by Robinson revealed the fact that a ball had entered the abdomen a little to the right and below the umbilicus; an hour later labor set in, resulting in the instrumental delivery of a dead child near full term, with a gunshot wound in its right shoulder. The ball was found in the débris. The mother made an uninterrupted recovery. Nietert records an interesting case of a self-inflicted gunshot wound in the abdomen of a pregnant woman, the ball passing through the uterus and the arm of the child, an abdominal section being followed by the recovery of the mother. Gunshot wounds generally occur either at the fundus or the anterior wall of the uterus.

Symptoms and Diagnosis.—The symptoms and diagnosis of wounds of the uterus vary from obscure to obvious. In wounds due to attempted abortion the symptoms may be those simply of an acute infection, and, in the absence of confession by the patient, the intrauterine condition may go unsuspected. In certain of these cases abortion has taken place, or is threatening. A slightly sanguineous discharge with increasingly bad odor is the chief local symptom. Local tenderness is shortly manifested, associated with a gradually increasing pulse rate, a vacillating temperature, and sweats. In cases of injury of the uterus from perforating wounds of the abdomen the external injury may be relatively very small, with no direct evidence of injury of the uterus. In other cases, with a small external wound, the injury to the uterus may be so extensive as to induce violent and even fatal hemorrhage and to have permitted the products of conception to have escaped into the abdominal cavity. In all such cases of perforating wound of the abdominal cavity the diagnosis should be established by exploratory incision.

Treatment.—Small aseptic wounds of the uterus not productive of active hemorrhage require no treatment. If, however, such wounds are the seats or atria of septic infection they require careful attention (see Infections of the Uterus). If such infection is associated with pregnancy, and if abortion has not occurred, the uterus should be at once emptied and, as far as possible, sterilized. To this end it should be carefully packed with gauze saturated with ten per cent. of iodoform in glycerin, or with five per cent. each of tincture of iodin and carbolic acid in glycerin; or, better still, cleansed with 98 per cent. pure carbolic acid, washed out immediately with alcohol. Glycerin is an agent of importance, as it is exosmotic in its effects upon the tissues and tends to inhibit their invasion by septic elements. Other details of treatment are given under the sections devoted to the various infections of the uterus.

If the pregnant uterus has been lacerated it should be treated as a case of rupture of the uterus (see Procedure for Rupture of the Uterus). Associated injuries must be treated according to their respective indications. In this connection it may be laid down as a rule to which there is no exception that every case of perforating wound of the abdomen of a pregnant woman should be subjected to an exploratory abdominal section without reference to symptoms. The probability of perforation of the uterus and of the consequent escape of amniotic fluid and blood into the peritoneal cavity makes it imperative that intervention should be both prompt and thorough. The fact also that in these cases the womb and its contents act as a sort of shield to the intestines, saving them from injury, increases the prospects of recovery of the mother and forms an additional reason for speedy intervention. The character and extent of the operation must be determined by the conditions revealed by the exploratory incision. If there has been extensive destruction of uterine tissue, offering no reasonable prospect of recovery with the uterus *in situ,* hysterectomy should be done. This rule applies whether the uterus has been emptied or not. All débris should be washed from the abdominal cavity by copious irrigation with normal salt solution, and intravenous injection or hypodermoclysis should be practiced in the presence of the generally pronounced shock, or whenever there has been a free loss of blood. If the gravid uterus has thrown off its contents the necessity for abdominal section is all the more imperative, for the very contractions of the uterus, which result in the expulsion of the embryo, result also in the extrusion of the liquid contents of the uterus into the peritoneal cavity.

RUPTURE OF THE UTERUS DURING PARTURITION

For rupture of the uterus during parturition see Surgical Conditions of Pregnancy and Parturition.

CHAPTER V

INJURIES OF THE FALLOPIAN TUBES

Injuries of the Fallopian tubes may be classified as:

(a) Rupture due to ectopic pregnancy (see Ectopic Pregnancy in division on Pregnancy and Parturition).

(b) Perforation due to suppuration (see Pyosalpinx in division on Infections).

(c) Surgical injuries. In view of the morphology, attachments, mobility, and protected location of the Fallopian tubes, it may be said that they are never subjected to traumatic injury in the usual acceptation of the term; It, therefore, remains for us to consider only surgical injuries in the present connection.

Surgical injuries of the Fallopian tubes occur:

(a) Incidentally in connection with operations addressed to the organs or structures, and

(b) For the purpose of sterilization.

(a) Incidental injury of the Fallopian tubes may occur accidentally by an operator carelessly applying a clamp in an effort to control the circulation during an operation that need not sacrifice the tube, and for conditions not destructive of reproduction. Such pressure is liable thus to destroy the lumen of the tube. It frequently happens that, following removal of the ovaries, the Fallopian tubes become functionally meaningless appendages, potent only for mischief, and are consequently removed at the same time. In certain instances they are accidentally injured.

Treatment is based upon the fact that a Fallopian tube with its lumen destroyed is worthless and should be removed; while all Fallopian tubes susceptible of serving as oviducts should be restored and saved.

STERILIZATION OF WOMEN

It occasionally happens that women should be spared from or deprived of the possibility of conception. This is true whenever pathologic conditions exist that will permit of conception, but render parturition either impossible or unduly hazardous. One of the most important sociologic questions of the day is the expediency of depriving certain defectives and criminals of the power of reproduction. A number of states have actually enacted laws for males belonging to these classes. The work of Sharp and Peyton in the Indiana State Reformatory has established both the safety and desirability of vasectomy as a protection to society. This procedure upon the male, i. e., vasectomy, viewed from the surgical standpoint, is to be classified as a minor operation. In women the division of the oviduct, while far from dangerous, is necessarily a more complicated procedure, involving as it does the necessity of opening the abdominal cavity. It may often be done incidentally to other operations.

45. PROCEDURE FOR THE STERILIZATION OF WOMEN

(1) The patient, after anesthetization, is placed in the Trendelenburg position.

(2) The abdomen is opened in the median line.

(3) One Fallopian tube with the uterus is brought into the field of operation.

(4) The tube is then divided by being cut across with a single snip of the scissors about a half inch from the uterine juncture, care being taken not to divide the underlying ovarian artery.

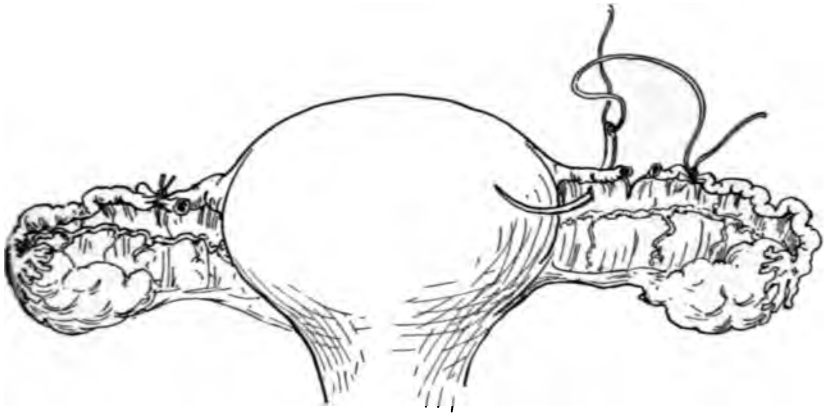


FIG. 131.—(45) PROCEDURE FOR THE STERILIZATION OF WOMEN. The method of dividing and ligating the Fallopian tube is shown on the left side; the completed overlapping of the cut ends of the tube is shown in the right side. The position of the ovarian arteries is indicated.

(5) (a) The distal cut end of the tube is ligated as if it were an artery, both ends of the ligature being left long; (b) the needled end of the ligature is then passed under and around the proximal stump of

the tube; (c) the two ends of the ligature are again tied thus, causing the two ends of the tube to overlap (Fig. 131).

(6) The Fallopian tube of the opposite side is similarly treated.

(7) The abdomen is closed.

It should be remembered that no ligature of the Fallopian tubes is required for hemostasis, and it may be omitted, but there is a remote liability that the lumen of the tube may be reëstablished. The object, therefore, is to secure the overlapping of the cut ends of the tube as shown. If by accident the ovarian artery should be cut, it can be controlled by passing the same ligature deep enough to embrace it.

CHAPTER VI

INJURIES OF THE OVARIES

Injuries of the ovary may be said never to occur except as an incident of surgical procedure. It is generally the result of efforts to separate it from some other organ or structure to which it has become intimately adherent. In certain cases accidental pressure by hemostatic forceps may result in its necrosis and the loss of its functional powers.

Symptoms and Diagnosis.—An injury of the ovary due to separation of adhesions is generally recognized at the time of its occurrence. In certain instances, however, a serious question arises as to the significance of necessarily rough manipulation; whether or not it amounts to a traumatism that will sooner or later develop into a perioöphoritis, with exudation that, becoming organized, effectually inhibits ovulation and induces pain and other clinical phenomena referable to the ovaries. When these later symptoms, viz., pain and tenderness in the ovaries with recrudescences at the menstrual period, develop, the case is to be classified as one of chronic ovaritis with exudation (see Infections of the Ovaries). The diagnosis under such circumstances demands exploratory incision.

Treatment.—The treatment of the remote results of traumatism, surgical or otherwise, of the ovaries depends in large measure upon the character of the changes thus induced. An exudate may have become organized into a complete adventitious tunic, cystic degeneration may have ensued, or adhesions may have formed. In either event the treatment should begin with exploratory incision, made primarily to clear up obscure points of diagnosis. As further details of operation depend upon the conditions thus revealed, the reader is referred to the respective headings (e. g., Infections of the Ovaries and Neoplasms of the Ovaries).

CHAPTER VII

INJURIES OF THE URETHRA

Injuries of the urethra are (a) parturient, (b) traumatic, and (c) surgical.

Parturient injuries of the urethra have been considered in connection with injuries of the vagina, upon the wall of which the destructive force first becomes operative (see Urethrovaginal Fistulæ).

Traumatic injuries sometimes result from a fall, thrusting a large foreign body into the vulvar orifice. The whole urethrovaginal septum has been torn away in this manner, even to the extent of involving the base of the bladder. Foreign bodies introduced into the urethra by mistake in an effort to cause abortion, or for libidinous purposes, may injure the mucous membrane. Masturbation has caused dilatation of the urethra, and the urethral walls have been torn by efforts at sexual intercourse through that canal.

Surgical injuries, such as the excision of epitheliomata or carcinomata or of chancres, may destroy the septum in whole or in part. The divulsion of the urethra by large specula and by efforts to utilize it for digital exploration of the bladder has caused rupture, both of the inner coats of the urethra and of the sphincter, with resulting incontinence.

Symptoms and Diagnosis.—If the injuries are high and involve the urethral sphincter incontinence of urine will be one symptom. In any event the urine is discharged, in whole or in part, into the vagina instead of through the urethral orifice. Physical exploration readily establishes the diagnosis.

Treatment.—When from any cause the urethral septum has been torn away, or otherwise destroyed, or in cases in which it has never developed, there is urgent demand for the establishment of a urethra. Efforts to transplant a urethra from the lower animals have been made by Fenwick, who transplanted the freshly removed urethra from a sheep, and by Pringle, who used part of a bullock's urethra. The practice deserves further trial.

Plastic operations for the establishment of a urethra have been successful. They must vary according to the conditions to be overcome.

46. KELLY PROCEDURE FOR REËSTABLISHMENT OF THE URETHRA

(1) Tunnel a channel just above the vestibule and under the symphisis pubis up to the vesical opening.

(2) Dissect loose down to its base a broad tongue of tissue in the anterior wall, with its apex above and its base at the opening into the bladder.

(3) Carry a pair of forceps through the hole made above the vestibule and seize the tip of the tongue of tissue.

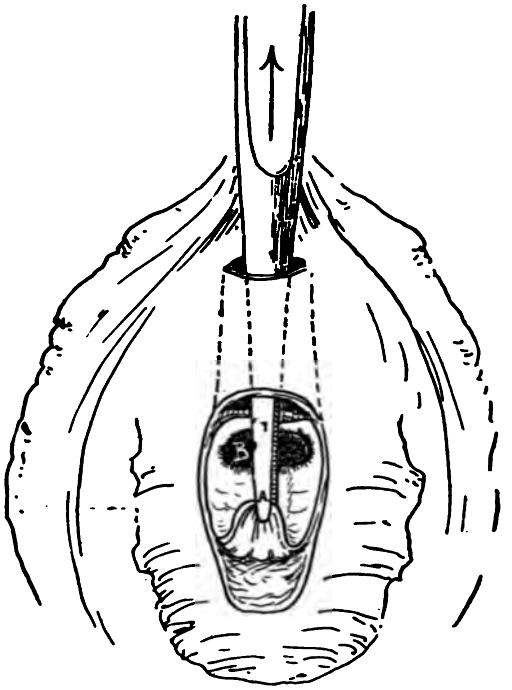


Fig. 132.—(46) Kelly Procedure for Formation of a New Urethra. (After Kelly.)

(4) Draw the tongue of tissue up through the tunnel and fix it at the outer orifice with sutures of fine silk.

(5) If small fistulous openings occur at either side of the base of the flap they can be readily closed at a secondary operation.

This ingenious technique has been successful in the hands of its originator. The resulting urethra was an efficient urinary channel and afforded confidence when the patient was lying down. It did not, however, give her control when in the upright posture.

47. PROCEDURE FOR REËSTABLISHING SPHINCTERIC CONTROL IN CERTAIN CASES OF OVERDIVULSION OF THE URETHRA

(1) Begin at the vestibule (Fig. 133) and dissect the urethra and entire anterior vaginal wall away from the os pubis to the depth of about 3 cm., or until the point of insertion of the levator ani muscle into the os pubis is reached.

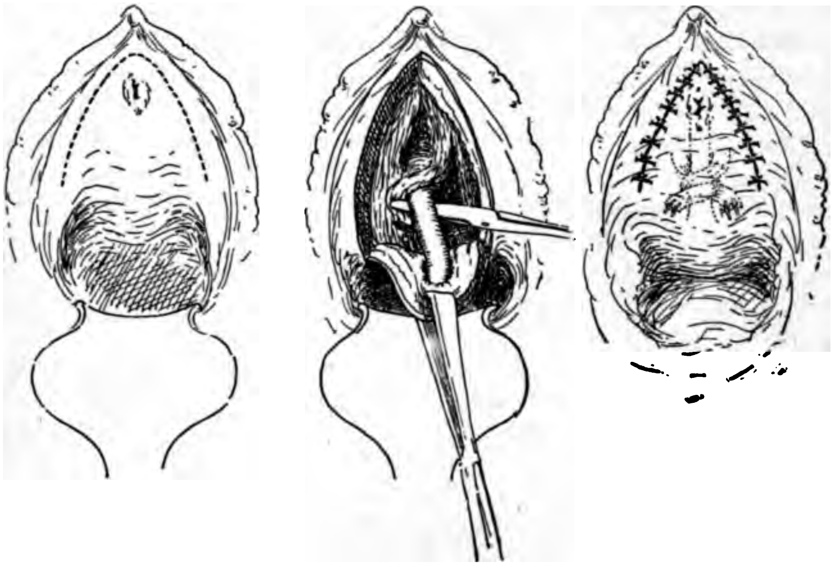


FIG. 133. FIG. 134. FIG. 135.

FIGS. 133–135.—(47) PROCEDURE FOR RESTORATION OF SPHINCTERIC CONTROL OF THE BLADDER.

FIG. 133.—(a) Line of incision, the urethra and the pubes.

FIG. 134.—(b) The flap embracing the urethra and anterior vaginal wall is drawn down, the levator ani is isolated at its insertion in the pubes, a bundle of fibers is cut loose, carried around the urethra at the base to the parent muscle; the same thing may or may not be done from the other side.

FIG. 135.—(c) When completed on both sides, the urethra is encircled with a muscular band that is under voluntary control.

(2) Carry the dissection down the edge of the levator ani muscle for a distance of about 3 cm. on either side of the vagina.

(3) Dissect the urethra away from the vaginal wall, beginning at the urethrovesical juncture and extending outward about 50 mm.

(4) Seize the margin of the levator ani muscle as far down on one side of the vagina as practicable, draw it up into the wound, divide a bundle of fibers half the size of a lead pencil, split them from the body of the muscle tip to its pubic insertion, carry the free end of this bundle

to the other side, bring it under the urethra, and stitch it fast to its parent muscle with chromic catgut (Fig. 134).

(5) Do the same thing with the levator ani muscle of the opposite side.

(6) Readjust the parts and close the external wound with interrupted sutures (Fig. 135).

In two cases in my practice this operation has resulted in complete restoration of sphincteric control. This depends upon the new muscular arrangement (Fig. 135—dotted lines) by which the urethra at its juncture with the bladder is given the supporting influence of an actual sphincter. The adaptation of the sphincter ani muscle to its new purpose seems to involve no new development of function. In both cases, as soon as the soreness had subsided, the new sphincter responded to the voluntary impulse from the bladder. The patient should be catheterized every six hours for the first few days.

48. STARK PROCEDURE FOR INCONTINENCE OF URINE DUE TO OVERDILATATION OF THE CYSTIC ORIFICE OF THE URETHRA

(1) With the patient in the dorsal position, a urethral sound is inserted and entrusted to an assistant.

(2) The urethra at its cystic extremity is exposed by incision through the vaginal membrane, the two flaps of which are dissected back until the whole width of the urethra is exposed.

(3) An ellipse of tissue is removed from the presenting wall of the urethra, the lumen of which is thereby freely exposed.

(4) The urethral wound is now closed by interrupted catgut suture.

(5) The wound in the vaginal membrane is now closed by extra interrupted silkworm gut or wire sutures.

CHAPTER VIII

INJURIES OF THE BLADDER

Injuries of the bladder may be (a) parturient, (b) traumatic, (c) surgical, and (d) secondary to other conditions.

(a) *Parturient injuries of the bladder* take the form of fistulæ and are caused by necrosis from prolonged pressure, or by the tearing of inelastic tissues by distention. These injuries are considered in connection with injuries of the structures primarily injured in the induction of the fistulæ (see Vesicovaginal Fistulæ and Vesicocervical Fistulæ, etc.).

(b) *Traumatic injuries* are chiefly ruptures due to external violence, such as a blow, kick, or fall, upon the distended bladder. Such ruptures generally occur in the anterior wall, rather low down, most frequently involving the extraperitoneal space at the base of the bladder. McRae states that there is no recorded case of *punctured wound* of the bladder. There were 183 shot wounds of the bladder during the Civil War, but the author knows of no recorded case, then or since, occurring in a woman.

(c) *Surgical injuries of the bladder,* accidental in character, sometimes occur unavoidably in the course of intraabdominal operations. In certain cases of tumor the bladder is adherent to the mass, by which it is often distorted and displaced until it is difficult of recognition. The author has had cases of large cyst of intraligamentary origin, in which the bladder was spread over the anterior wall, by which it was carried above the umbilicus, the extraperitoneal space extending two inches above the pubes. In certain cases the bladder wall is torn in the act of breaking up extensive adhesions within the pelvis, particularly if the adhesions are old enough to have become somewhat firm, but too recent for absorption of the infiltrate to have taken place.

(d) *Secondary injuries of the bladder* may be said to be restricted to the perforation of its wall by suppurations originating in the Fallopian tubes and other structures. In this way purulent and even fecal fistulæ communicating with the bladder may become established. Malignant disease of the cervix and bladder in certain cases penetrates the bladder wall.

Symptoms and Diagnosis of Injuries of the Bladder.—(a) The essential symptom of *parturient injuries* of the bladder is incontinence of urine. Physical exploration of the vagina by the finger, speculum, and sound will generally demonstrate the opening.

(b) In *traumatic injuries* rupture is indicated by the extravasation of urine into the suprapubic cellular tissue, when the rupture is located in the extraperitoneal area of the bladder wall, or by a diminished flow of urine through the urethra, when the rupture communicates with the peritoneum. In such cases there are increasing tenderness and distention of the abdomen with gradually developing area of fluctuation. There will have been intense pain with more or less collapse at the time of injury, which will have been followed by more or less hemorrhage from the bladder. If the rent is extensive and all the urine escapes into the peritoneum some clots will be found on catheterization, a symptom which, taken in connection with anuria and with a history of injury, is conclusive of intraperitoneal rupture. Cystoscopic examination may clear up the diagnosis in cases of doubt.

(c) *Surgical injuries* of the bladder are generally detected at the time of their occurrence. In some instances, however, tissue necrosis from forceps pressure may result in the later formation of a fistula. In such instances the history of an operation involving such pressure and the local symptoms enumerated in the preceding paragraph ought to clear up the diagnosis.

(d) *Secondary injuries* are susceptible of diagnosis by establishing the fact of the preëxisting disease, its character, and location. Discharges through or from the bladder are the essential symptoms.

Treatment.—The treatment of parturient injuries is given in connection with the treatment of the various urinary fistulæ. Traumatic injuries should be treated by immediate operation. In cases of rupture the procedure of Ramon Guiteras, given below, should be followed in all essential particulars. Gunshot wounds of the bladder should be treated like ruptures. In enterovesical fistula the technique for the repair of enterovaginal fistula (q. v.) is applicable.

49. GUITERAS PROCEDURE FOR REPAIR OF RUPTURED BLADDER

(1) The patient is placed flat in the dorsal position.

(2) An incision is made in the median line above the pubes and down to but not into the peritoneum.

(3) The extraperitoneal space is then opened into the bladder and, if urine or blood is found, it is evacuated and the tissues cleared with peroxid.

(4) The wound in the bladder is then looked for; when it is found

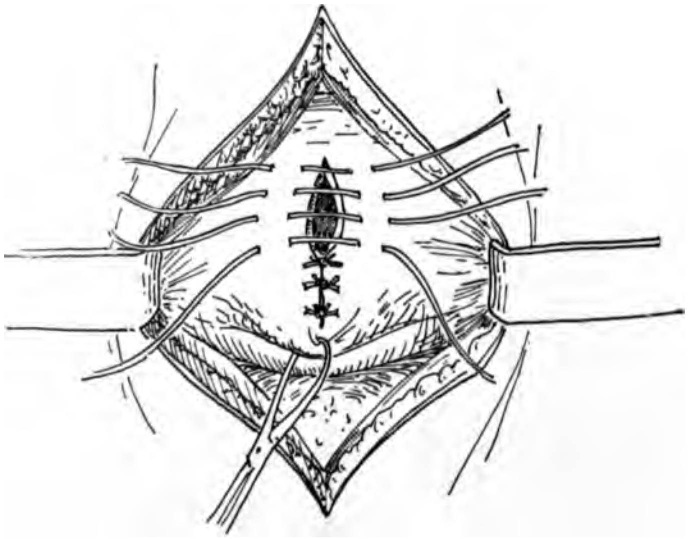


FIG. 136.—(49) PROCEDURE FOR REPAIR OF RUPTURED BLADDER. (a) Extraperitoneal tear in anterior wall, sutures inserted. (After Guiteras.)

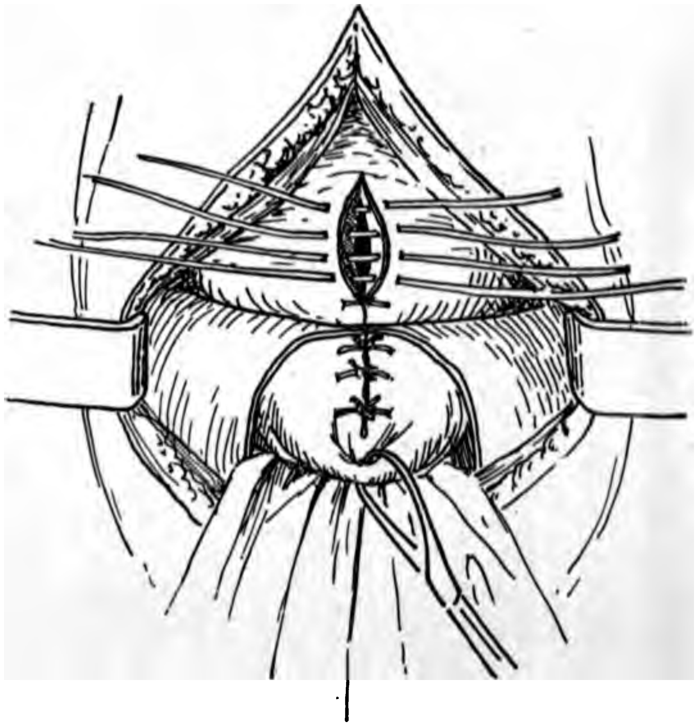


FIG. 137.—(49) PROCEDURE FOR REPAIR OF RUPTURED BLADDER. (b) Intraperitoneal tear closed by Lembert suture. (After Guiteras.)

the adjacent tissues are dissected away, and, if possible, the opening is brought up into the field of operation, one finger having been introduced into the bladder to serve as a guide and to facilitate manipulation.

(5) Search is made with the intravesical finger to discern additional ruptures of the bladder.

(6) The peritoneal cavity is opened, if found necessary.

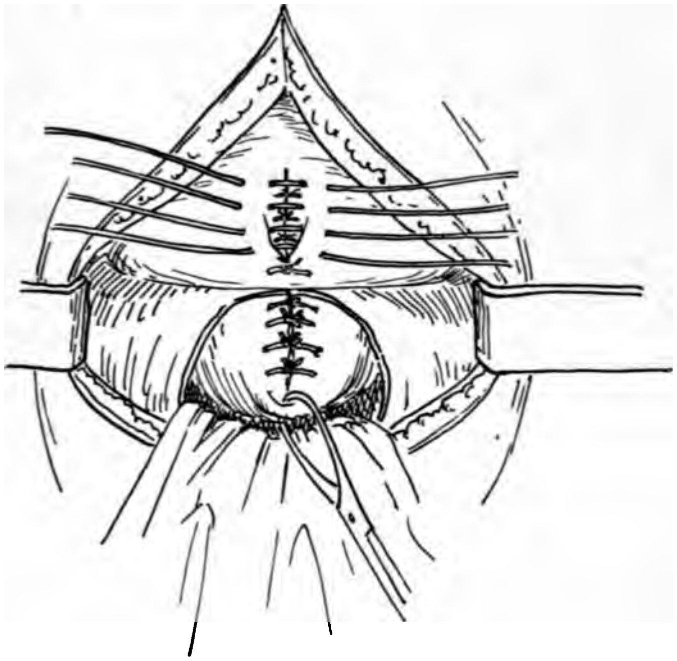


Fig. 138.—(49) Procedure for Repair of Ruptured Bladder. (c) Extraperitoneal tear closed, intraperitoneal closed and second row of sutures inserted. (After Guiteras.)

(7) If the margins of the point or points of rupture are ragged, ecchymotic, or necrotic they are trimmed away.

(8) The ruptures are closed by Czerny-Lembert or other interrupted suture (Figs. 136, 137, 138).

(9) The toilet of the peritoneum is perfected, if necessary, by free irrigation with peroxid solution, followed with normal salt solution.

(10) A mushroom-tipped soft catheter is inserted through the urethra and left in and the abdominal incision is closed.

CHAPTER IX

INJURIES OF THE URETER

Injury to the ureter by which a fistulous opening results generally requires the operation of anastomosis for its correction. This is made necessary because the caliber of the ureter is so small and its wall so thick that any effort at an infolding operation almost invariably results in obstruction.

Anastomotic operations on the ureter divide themselves into three classes, viz.:

(1) Anastomosis between two segments of a divided ureter (*uretero-ureterostomy*).

(2) Anastomosis between the ureter and the bladder (*ureterocystostomy* or *ureterovesical implantation*).

(3) Anastomosis between the ureter and the intestine (*uretero-enterostomy* or *ureterointestinal implantation*).

These operations may be primary, by which is implied that they are done at the time of the injury to the ureter, as in the course of some surgical procedures, or they may be secondary, by which is implied that they are done at some period remote from the receipt of the injury.

Primary operations are generally done either with the ureter already exposed, as in the course of abdominal hysterectomy or ovariotomy for the removal of a large cyst. When the ureter is injured in the course of a vaginal hysterectomy the accident is but rarely discovered until some time after the injury has been inflicted. When the condition is attended to at once, with the abdomen open, some of the procedures which are outlined hereafter are advised.

In *secondary operations,* or even primary ones in which the ureter is not essentially in hand, the question of exposure of the ureter is the first to be considered. This is done by either (a) the transperitoneal route, or (b) the extraperitoneal route, according to the conditions presented or the predilections of the operator.

50. PROCEDURE FOR TRANSPERITONEAL EXPOSURE OF THE URETER

(1) Make the incision through the abdominal wall on either the median line or laterally over the affected side.

(2) Introduce the hand up to the kidney and, with the index finger and thumb, follow the ureter down to the point of injury; then explore the lower segment in the same way.

(3) If the point of operation in the ureter should prove to be inaccessible by this route change the procedure to an extraperitoneal operation, leaving the abdominal incision open for subsequent convenience.

(4) If the point of operation in the ureter should prove accessible seize the open point of a fistulous ureter, or either end of a divided one, and draw it away from the abdominal wall.

(5) Incise the peritoneum along the line defined by the taut ureter for about 2 to 3 cm. each way.

(6) Subsequent steps should be by anastomotic procedures hereafter described (q. v.).

This procedure is very important and often necessary for preliminary abdominal exploration. It not infrequently happens, especially in dealing with ureteral calculus (ureterolithotomy), that one hand within the abdomen acting as a guide adds to the ease, completeness, and safety of an extraperitoneal operation.

50a. MORRIS (H.) PROCEDURE FOR EXTRAPERITONEAL EXPOSURE OF THE URETER BY THE LUMBO-ILIO-INGUINAL ROUTE

(1) The patient is placed on the well side with the abdomen a little downward. Do *not* put a support under the opposite side.

(2) Make an incision from a little below the twelfth rib, obliquely downward and forward, around the crest of the ilium 2.5 cm. internally to the anterior superior spinous process, and thence parallel to and 2.5 cm. above Poupart's ligament, half way to the pubes (Fig. 139).

(3) Carry the incision down to, but not through, the peritoneum.

(4) Expose the kidney.

(5) Seize the pelvis of the kidney between the thumb and finger and exercise slight traction to make the ureter more prominent.

(6) With the fingers or a strip of gauze dissect back the peritoneum until the ureter is exposed, from which point the canal may be followed as far down as necessary. In carrying out this last manipulation it is well to remember that the ureter is rather constantly adherent to the peritoneum where the latter crosses the spine, and that when this point is reached in stripping back the peritoneum the ureter will generally be lifted up with it.

(7) If it is desired to explore the pelvic portion the patient is rolled a little toward her back, the incision is extended further forward above Poupart's ligament, and the peritoneum is lifted up until the ureter is reached.

(8) The ureter exposed, further steps are embraced in the anastomotic operations which follow.

To make this entire incision as a preliminary step is manifestly an unnecessarily formidable procedure. The technique is given, however, for the reason that, by judicious modification of details embodied therein, it embraces the essential principles of the operation.

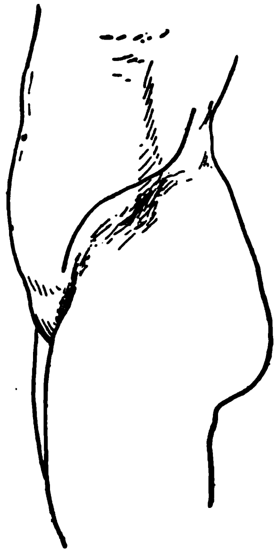


FIG. 139.—(50a) MORRIS (H.) PROCEDURE FOR EXTRAPERITONEAL EXPOSURE OF THE URETER. The course of incision is shown.

51. DELBET PROCEDURE FOR EXTRAPERITONEAL EXPOSURE OF THE URETER BY THE SACRAL ROUTE

(1) The patient is placed upon her side with her face and abdomen inclined a little downward and her legs a little flexed.

(2) Make an incision along the border of the coccyx with the short arm of an L extending from the upper end of this incision parallel with the fibers of the gluteus maximus.

(3) Cut the insertion of the gluteus maximus and the sacrosciatic ligaments and some fibers of the pyriformis.

(4) Expose the side of the rectum with forceps and a director.

(5) The ureter is found adherent to the peritoneum and can be readily followed downward to the bladder, or upward 7 or 8 cm.

Morris states that, in consequence of the presence of the broad ligament in women, this operation is less desirable in them than in men.

52. VAN HOOK PROCEDURE FOR URETEROURETERAL ANASTOMOSIS

(*Ureteroureterostomy*)

(1) Split the upper or renal end of the ureter on the posterior side from 3 to 5 mm. to prevent subsequent stenosis (Fig. 140).

(2) Ligate the tip of the lower or vesical segment of the ureter (Fig. 141).

(3) Make an incision in the upper or renal segment, beginning just below the ligature, and extending about 1 cm. vertically downward and just deep enough to communicate with the lumen (Fig. 141).

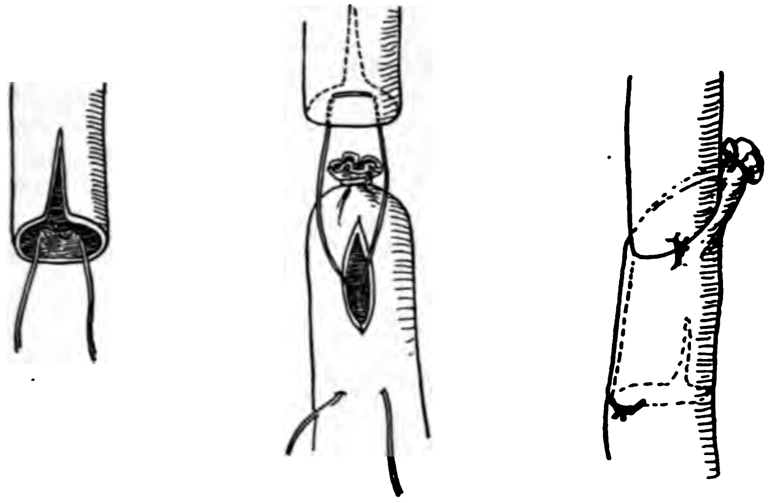


Fig. 140. Fig. 141. Fig. 142.

Figs. 140–142.—(52) Van Hook Procedure for Ureteroureteral Anastomosis.

Fig. 140.—(a) The lip of the renal segment has been incised and the suture inserted.

Fig. 141.—(b) The vesical segment has been ligated and incised and the ends of of the suture brought out through the vesical segment.

Fig. 142.—(c) The anchorage suture has been tied and the anastomosis has been fortified by a supplementary suture.

(4) Insert a fine suture through the tip of the renal segment, bringing the ends out, one upon either side of the vesical segment 2 or 3 mm. below the lower end of the vertical incision (Fig. 141).

(5) With traction on the two ends of the suture draw the renal tip through the incision into the vesical segment and tie the ends (Fig. 142).

(6) If deemed expedient, a supplementary suture or two may be passed through the lip of the vesical segment and through the outer layer of the invaginated renal segment.

Binnie emphasizes the fact that, wherever possible, the extraperitoneal route should be selected for ureteroureteral anastomosis.

53. GUITERAS PROCEDURE FOR TRANSPERITONEAL URETEROVESICAL IMPLANTATION

(*Ureterocystostomy*)

(1) Open the abdomen freely in the middle line.

(2) The lower segment of the ureter is ligated at the tip and cauterized.

(3) The upper segment is located and brought up. If retracted and difficult to find begin at the iliac vessels and liberate it from that point to its end.

(4) Two slits, 5 mm. long, are made in the end of the canal on either side and everted.

(5) An oblique incision, large enough to accommodate the ureter, is made in the wall of the bladder.

(6) A suture is now inserted on one side of the incision (a) through the bladder wall, (b) out through the incision, (c) out to in, into out, through one flap at the end of the ureter, (d) in through the incision, (e) out through the bladder wall at a point about 5 cm. from the point of beginning (Fig. 143).

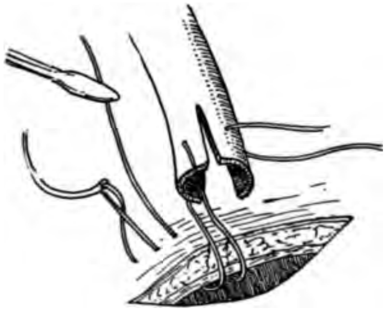


Fig. 143.

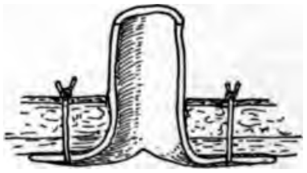


Fig. 144.

Figs. 143 and 144.—(53) Guiteras Procedure for Ureterovesical Implantation.

Fig. 143.—(a) The method of slitting the ureter, opening the bladder, and inserting the two anchorage sutures is shown. (After Guiteras.)

Fig. 144.—(b) The two anchorage sutures are tied. (After Guiteras.)

(7) A similar suture is similarly inserted on the other side of the vesical incision.

(8) The sutures are now drawn tight and tied, thus drawing the end of the ureter into the bladder and fixing it there (Fig. 144).

(9) If the vesical opening does not fit the ureter snugly a supplementary superficial suture of catgut should be inserted.

The union of the vesical collar to the ureter effects the anastomosis. The anchorage sutures should be of absorbable material. Care should be taken that no traction is exercised at the point of anastomosis. A self-retaining catheter should be worn for a week. This simple technique, which has been highly successful in the hands of its author, commends itself for its simplicity and evident efficiency.

54. SAMPSON PROCEDURE FOR TRANSPERITONEAL IMPLANTATION OF THE URETER INTO THE BLADDER

(*Ureterocystostomy*)

This method as exemplified and described by Kelly is as follows:

(1) The ureter in the peritoneal flap is drawn down into contact with the bladder.

(2) A pair of forceps is inserted through the urethra and caused to push up the bladder wall at the post most available for anastomosis, which should be as near as practicable to natural ureteral site.

(3) An incision about 1 cm. is made in the bladder wall, and the forceps pushed through (Fig. 145).

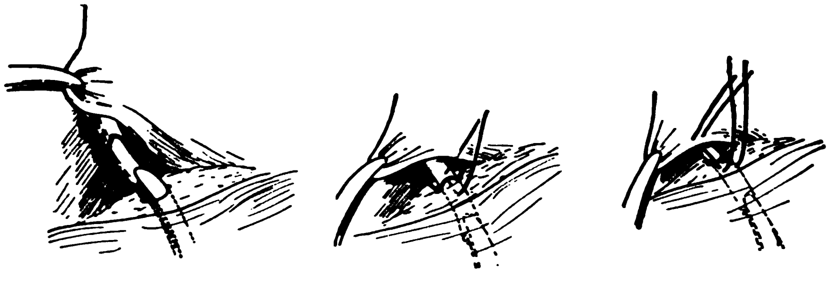


FIG. 145. FIG. 146. FIG. 147.

FIGS. 145–147.—(54) SAMPSON PROCEDURE FOR URETEROVESICAL IMPLANTATION.

FIG. 145.—(a) The peritoneal flap containing the ureter is drawn down to the bladder, and the lower end of the bared ureter is drawn into an opening made in the bladder. (After Kelly.)

FIG. 146.—(b) The ureter and its sheath are sutured to the bladder wall. (After Kelly.)

FIG. 147.—(c) The ureter and sheath and the peritoneal sheath in which the ureter lies have been sutured to the bladder wall and to the peritoneal covering of the bladder. (After Kelly.)

(4) The end of the ureter is split open for a distance of 3 to 5 mm. and, after being stripped from its sheath for 1.5 to 2 cm., it is grasped by the intravesical forceps and drawn into the bladder (Fig. 146).

(5) The bladder wall is sutured with a fine mattress suture of fine silk to the ureteral wall, each suture grasping only the muscular coats of the bladder and ureter, care being taken not to compress the ureter. As a rule, only two or three sutures are sufficient (Fig. 147).

(6) It is important in this procedure, according to Sampson, to suture to the bladder wall both the ureteral sheath and the peritoneal flap to which the ureter with its sheath is attached.

55. VAN HOOK PROCEDURE FOR TRANSPERITONEAL IMPLANTATION OF THE URETER INTO THE BLADDER

(*Ureterocystostomy*)

(1) The ureter and bladder are exposed by the transperitoneal method (q. v. *ante*).

(2) The end of the renal segment is split to prevent stenosis.

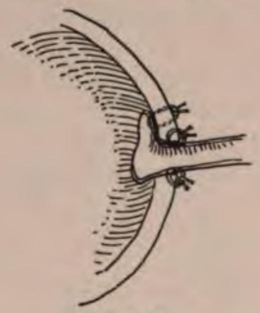


FIG. 148.

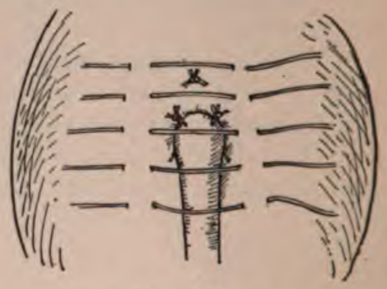


FIG. 149.

FIGS. 148 AND 149.—(55) VAN HOOK PROCEDURE FOR IMPLANTATION OF THE URETER INTO THE BLADDER.

FIG. 148.—(a) The method of anchorage. (After Binnie.)
FIG. 149.—(b) The anchorage sutures are shown tied with the Lembert sutures inserted ready to be tied, thus covering the field of operation. (After Binnie.)

(3) The bladder wall is opened by a short incision.

(4) The end of the ureter is inserted and one of the flaps anchored by a suture through it and the abdominal wall (Fig. 148).

(5) Two supplementary sutures are placed at the angles of the incision, and one a little up on each side of the ureter.

(6) The first site of implantation and the first 2 cm. of the urethra are with vesical folds drawn together by Lembert sutures (Fig. 149).

While the Lembert suture furnishes some support, in this operation it is also liable to cause later constriction and consequent stenosis of the ureter. The simple procedure of Guiteras is preferable and equally safe.

56. MONARI PROCEDURE FOR LATERAL ANASTOMOSIS OF THE URETER

(*Ureterocystostomy*)

This procedure is an adaptation of the technique of lateral anastomosis of the intestines to lateral anastomosis of the ureters.

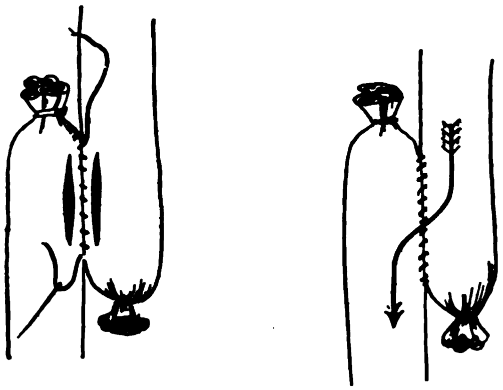


FIG. 150. FIG. 151.

FIGS. 150 AND 151.—(56) MONARI PROCEDURE FOR LATERAL ANASTOMOSIS OF THE URETERS.

FIG. 150.—(a) Ligation of the tips of the two segments, the incisions to be approximated, and the line of suture.
FIG. 151.—(b) The anastomosis completed.

(1) Lift up the ends of the ureters and liberate each end from its sheath for a distance of from 2 to 3 cm.

(2) Ligate each segment at its open tip.

(3) Draw the ends past each other about 2 cm. and hold them there while a vertical incision about 1 cm. long is made down to the lumen of each (Fig. 150).

(4) The surfaces are then stitched together, opening to opening (Fig. 151).

This operation is difficult to perform, has a tendency to give way, and the anastomotic orifice is disposed to close.

57. AUTHOR'S PROCEDURE FOR IMPLANTATION OF THE URETER INTO THE INTESTINE

(*Ureteroenterostomy*)

(1) The ureter is exposed by the transperitoneal route.

(2) The end of the renal segment of the ureter is found, elevated about 3 cm., and laterally incised to the depth of from 3 to 5 mm., thus making two flaps.

(3) A loop of intestine, preferably the sigmoid flexure, is brought up, stripped of its contents, and a middle loop tied off by two compression ligatures.

(4) A small opening, large enough to accommodate the ureter, the peritoneal opening being a little longer than the deeper opening, is made in the wall of the intestine (Fig. 152).

(5) A suture is inserted at the lower angle of the intestinal incision (a) under the peritoneum; (b) through the muscularis and mucosa; (c) out through the incision; (d) out to in, into out, through one flap of the ureter; (e) in through the incision; (f) out through the mucosa and muscularis, but under the peritoneum, near the point of beginning.

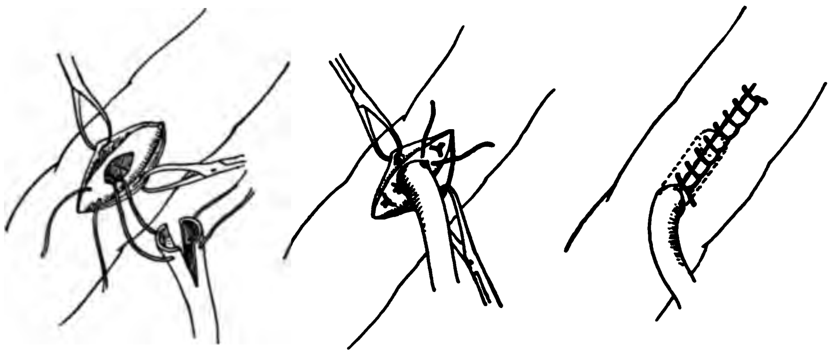


FIG. 152. FIG. 153. FIG. 154.

FIGS. 152–154.—(57) PROCEDURE FOR URETEROINTESTINAL IMPLANTATION.
FIG. 152.—(a) The peritoneum of the intestine is incised and dissected back, the intestine is opened by stab puncture, each flap of the split ureter is loaded with fixation suture, the ends of which are carried into the intestines through the opening and out through the mucosa and muscularis.
FIG. 153.—(b) The fixation sutures tied.
FIG. 154.—(c) The peritoneum brought together over the end of the implanted ureter.

(6) A similar suture is passed at the other angle of the intestinal incision, similarly transfixing the other ureteral flap.

(7) These two anchorage sutures are now tied, thus drawing the end of the ureter into the intestinal cavity and anchoring it there (Fig. 153).

(8) A supplementary anchorage suture is passed through the muscularis, mucosa, ureteral wall, mucosa, and muscularis at each angle of the deep incision.

(9) The peritoneum is stitched over the tied catgut sutures and over the lower 1.5 cm. of the implanted ureter, the last suture embracing a part of the ureteral wall, thus serving to anchor the peritoneum (Fig. 154).

This procedure, an adaptation of the Guiteras technique for ureterocystostomy, becomes available when there has been a relatively high division of the ureter, and when, from recession of the ureter or injury to the bladder or from any other cause, restoration of the urinary tract is impracticable. Emphasis is to be placed upon the variation from the original Guiteras procedure made necessary by the anatomical peculiarities of the intestinal wall. This is flexible and thin, and is distended with gas that will find its way through a puncture by a through-and-through suture. It is, therefore, necessary that a broader surface for union be furnished, and that the punctures made by the anchorage sutures be covered with peritoneum.

An objection to ureterocystostomy is that the rectum is not entirely tolerant of urine; also the fact that there is liability to ascending infection through the ureter and consequent involvement of the kidney.

CHAPTER X

INJURIES OF THE KIDNEYS

Injuries of the kidneys, more frequent among men than women, are always serious accidents. They are divisible into two general classes, viz.:

(1) Injuries due to external violence and embracing contused wounds and rupture of the organ.

(2) Injuries due to transparietal penetration of the kidney and embracing incised and gunshot wounds.

Injuries due to external violence occur with slightly greater frequency on the right side, although the accident may occur coincidentally on both sides. A direct blow or a fall are the more frequent forms in which the violence occurs. Crushing between antagonistic forces, as between cars while being coupled, or by being run over by a vehicle, is an example of another form of violence. The conjecture that rupture of the kidney may result from muscular exertion is not well sustained, especially in women.

CONTUSIONS OF THE KIDNEYS

The injury inflicted upon the kidney by such incidence of force may amount merely to a contusion without severance of continuity to either the parenchyma or the capsules.

Symptoms and Diagnosis.—The patient who has been the victim of a blow or of a fall upon the kidney may or may not lose consciousness. She, however, speedily develops a cold surface, pallor, a small pulse, painful respiration, subnormal temperature, and all the symptoms of shock. In the course of an hour reaction will have set in, the expression improves, the pulse regains its volume and force, the surface is warm, and the temperature normal. The pain referable to the kidney may, however, have increased in severity, radiating down the ureters and into the thigh; muscular resistance and superficial tenderness are also more marked—two symptoms depending for their exacerbation upon the increasing congestion, and consequently increasing pressure within the kidney. Blood may or may not appear in the urine. Its presence in small quantities is indicative of some associated rupture of the parenchyma. If, however, the blood is present in large quantities, the case is to be classified as one of rupture of the kidney (q. v. *post*).

Treatment.—Contusions of the kidney, even when associated with slight discharge of blood, generally recover without treatment. In any event there is no cause for immediate surgical intervention, unless the symptoms, especially the shock, show increasing severity after from a half an hour to an hour. In the meantime heat should be applied to the extremities, especially to the head and feet, and ice should be applied over the kidney. The patient should be kept at absolute rest with the head lowered. Anodynes should not be given if they can be avoided, at least for the first hour, as they have a tendency to mask the real condition of the patient. Heart stimulant, such as nitroglycerin and later strychnia, should be given.

RUPTURE OF THE KIDNEY

Rupture of the kidney may be induced by the same class of accidents that cause contusions of the organ. The force, however, may have been somewhat different in both direction and volume. The muscular relaxation at the instant may have been greater and the general resistance may have been less, all of which would tend to account for the more serious injury.

Rupture of the kidney (a) may be confined to the parenchyma, or (b) it may extend to and involve the capsule. There may be extensive

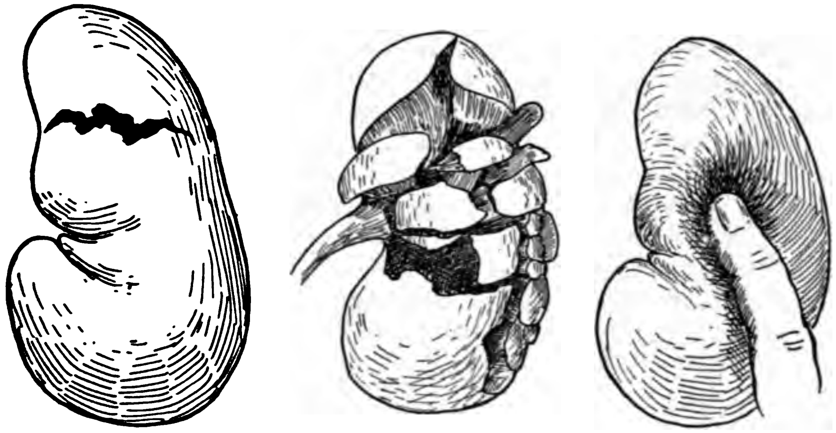


Fig. 155. Fig. 156. Fig. 157.

Fig. 155.—Single Unipolar Rupture of the Kidney. (After Lejars.)
Fig. 156.—Multiple Rupture of the Kidney. (After Lejars.)
Fig. 157.—Crushed Kidney without Rupture of the Capsule through which the Organ Feels Like a Sac of Fluid.

injury of the deep structures without involvement of the capsules, but rupture of the capsule always implies involvement of the parenchyma. In some instances only the smaller vessels are injured; in others the larger vessels are more or less injured; while in certain rare cases the kidney seems to be almost torn from its external and venous attachments. Rupture of the parenchyma may be restricted to what may be termed a "fracture" of the substance, extending from the pelvis to the capsule, but not involving the capsule (Fig. 155). In other cases there may be multiple fractures (Fig. 156), while in still others the substance becomes essentially pultaceous and feels like fluid when compressed through the capsule (Fig. 157).

Symptoms and Diagnosis.—The most constant early symptom is shock, although it should be remembered that there have been severe, even fatal, cases of rupture in which shock was either light and evanescent or entirely absent. In such cases hemorrhage from the urethra was the first symptom to attract attention. These, however, are the very exceptional cases. Ordinarily there is extreme pain in the kidney with tenderness and profound muscular rigidity over the seat of injury. The pain extends down the ureter, into the bladder, and down the thigh of the affected side. This pain is liable shortly to assume the character of renal colic. Physically the symptoms may be more or less obscure. There may or may not be evidences of injury, although sooner or later ecchymoses or other evidences of extravasation make their appearance. This symptom is always progressive, and soon may involve not only the whole area of the affected loin, but that zone of the side and front of the abdomen. The most significant of the immediate symptoms is the sudden appearance of blood in large quantities in the urine. This symptom occurs at once, although it may or may not be detected until later, when the urine is voluntarily voided. If there has been much urine in the bladder at the time of the accident the blood will appear as a dark stain of the urine when it is voided. The next time it is voided, however, which may be within a few minutes, light red blood will be discharged from the urethra. This may be repeated at short intervals. A catheter introduced and retained in the bladder will show the extent of the circulation and prevent, or at least minimize, the formation of a clot in the bladder. The formation of a clot and the consequent persistent staining of the urine may give the impression of persistent bleeding, when in fact the hemorrhage may have ceased. Urine stained from a large clot is always dark in color, and its voidance is never followed by the appearance of fresh blood unless the hemorrhage continues. Here it should be remembered that, following the emptying of the bladder and the cessation of active hemorrhage from the kidney, the urine speedily becomes opaque and then clear. If successive washings of the bladder provoke fresh hemorrhage it is a sign that the blood is probably derived from the wall of the bladder, any laceration of which would naturally be opened by the distention incident to each successive irrigation. This is probably the only question at any time involved in the diagnosis. It may be settled by cystoscopic examination of the bladder. I wish here, however, to emphasize the fact that in the early and active stages of rupture of the bladder there is no possible justification either to annoy the patient or lose valuable time in an effort to settle the diagnosis by cystoscopic exploration, when that diagnosis has already been conclusively demonstrated by the clinical phenomena.

Blood or urine or both may find their way into the perinephric tissues, and thence into the peritoneal cavity. Secondary rupture of the peritoneum is, however, very rare, and perinephric extravasations speedily develop pronounced tumefaction. Hemorrhage into the perinephric tissues has been so extensive as speedily to prove fatal. The tumefaction induced by this accumulation is progressive and may become so extensive as to occupy the larger part of the upper quadrant of the abdomen on the side involved. When rupture of the peritoneum has occurred with consequent leakage into the abdominal cavity early symptoms of peritonitis develop. This is often preceded by uremia resulting from the absorption of urine from the peritoneal cavity.

Treatment.—Patients have died from hemorrhage within a half an hour after rupture of the kidney has taken place. This fact is the key to the treatment. I do not, however, wish to imply by this that every case of rupture of the kidney requires immediate or even later operation. As a matter of fact many kidneys that have been ruptured have recovered without any operation at all. I do, however, wish to impress upon the attending surgeon that, in the presence of profound shock and active hemorrhage, surgical exploration is vastly safer than non-intervention. When these symptoms are pronounced time spent in waiting for reaction is very liable to be time worse than wasted. As a matter of fact, the best means of securing reaction is to give ether or, preferably, nitrous oxid and oxygen. The cardiac and respiratory centers, like storage batteries, have been suddenly exhausted, and the very best way to recharge them is to inhibit further leakage and give the restoration powers a chance by anesthetization. In cases of profound shock associated with severe internal hemorrhage I have seen reaction set in after a few whiffs of ether.

If immediate intervention is resolved upon an intravenous injection of Fischer's solution,[1] or, if it is not available, normal salt solution, should be given at once, while preparations for operation are being made. If immediate operation is not resolved upon this is open to question, as it may tend to postpone the spontaneous arrest of hemorrhage.

---

[1] *Fischer's Solution:* Sodium carbonate, 10 grammes; sodium chlorid, 15 grammes; water sufficient for 1 litre. The sodium carbonate is placed in the

58. KELLY PROCEDURE FOR EXPOSING THE KIDNEY

The area of invasion is the superior lumbar triangle bounded by the twelfth rib, the quadratus lumborum, and the upper margins of the oblique abdominal muscles.

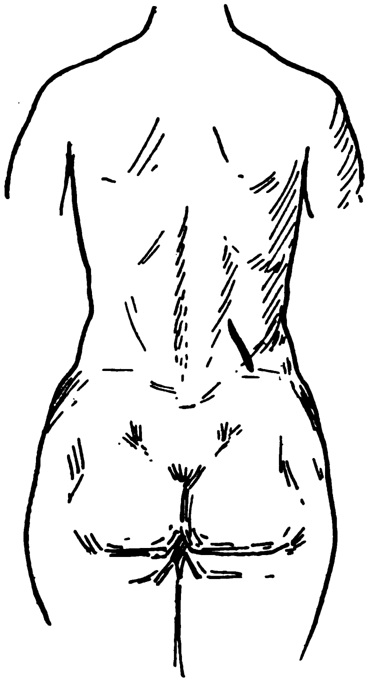


FIG. 158.—(58) KELLY PROCEDURE FOR EXPLORATION OF THE KIDNEY. Classic incision along the upper margin of the lumbar triangle.

(1) Make an oblique incision about 8 to 10 cm. long from the angle formed by the quadratus lumborum and the rib (Fig. 158).

(2) The latissimus dorsi is exposed and separated in the direction of its fibers.

(3) This exposes the whitish aponeurotic area at the apex of the lumbar triangle.

(4) A closed forceps is pushed through the aponeurosis and its blades separated, exposing the bright yellowish perirenal fat.

(5) The fascia and fat are drawn open with forceps or, preferably, with the fingers, exposing the kidney.

The procedure done as directed is practically bloodless, requiring no ligature. The incision may be enlarged if necessary, care being taken to avoid injury to the last dorsal and first lumbar nerves.

59. MAYO-ROBSON PROCEDURE FOR EXPOSING THE KIDNEY

(1) Make an incision from just at the inner side of the anterior spinous process of the ilium, and extending upward to the tip of the twelfth rib (Fig. 159).

(2) The external oblique is exposed and its fibers divided coincidentally with the incision up into the aponeurosis of the muscle.

water first and slowly brought to the boiling point. If this precaution is not observed ebullition will occur incident to the escape of free oxygen, thus reducing the salt to a subcarbonate. As soon as the solution has been brought to the boiling point the sodium chlorid is added.

(3) The split external oblique is retracted, exposing the internal oblique, which is then split from the ninth costal cartilage to the posterior-superior spine of the ilium.

(4) The transversus muscle is similarly split and retracted, exposing the transverse fascia.

(5) The transverse fascia is incised, exposing the perirenal fat, which is pushed to either side with gauze, thus bringing the kidney into view.

The advantages of this incision are that it is practically bloodless, and gives abundant room, enabling the surgeon to introduce his hand into the perirenal space and thus explore the entire organ *in situ*. It is easily susceptible of extension downward along the original line to expose the ureter.

60. LEJARS PROCEDURE FOR EXPOSING THE KIDNEY

(1) An incision is made from the middle of the twelfth rib obliquely downward to the crest of the ilium, and thence, if necessary, anteriorly along a part or the whole of the crest (Fig. 160).

(2) Expose, successively, the fibers of the external oblique, then the internal oblique, the aponeurosis of the transversalis, and split each as it is encountered, when the lumbar space will be exposed.

(3) Open the underlying renal fascia, push aside or wipe away the perirenal fat, and thus expose the kidney.

61. MORRIS PROCEDURE FOR EXPOSING THE KIDNEY

Morris, when exposing the kidney for possible nephrectomy, makes an incision parallel with, but 2 cm. below, the axis of the twelfth rib, beginning at about the middle of the rib and extending obliquely downward and forward to a point about 3 cm. above the middle of the crest of the ilium. Israel employs the preceding incision, but carries it a little farther forward, which may be justifiable when there is probability of necessity for removal of the ureter.

62. ISRAEL PROCEDURE (TRANSPERITONEAL) FOR EXPOSING THE KIDNEY

(1) Make an incision along the outer margin of the rectus muscle, just over the site of the affected kidney (Fig. 161).

(2) The peritoneal cavity is opened, the hollow viscera are pushed aside and kept out of the way by gauze rolls.

(3) The peritoneal capsule is opened and the kidney exposed.

This procedure may be available in cases of extreme nephroptosis, but under other circumstances is less practicable than the extraperitoneal methods.

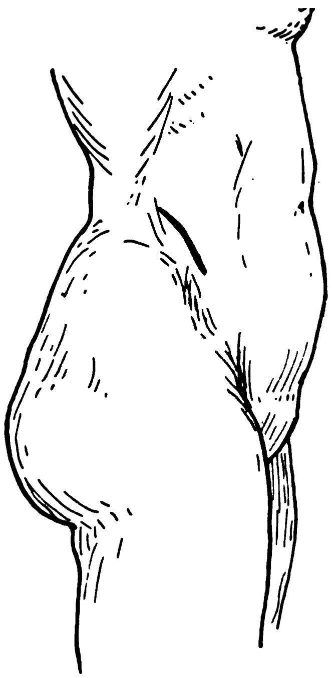


FIG. 159.—(59) MAYO-ROBSON PROCEDURE FOR EXPLORATION OF THE KIDNEY. Incision from the tip of the twelfth rib to just inside the anterior superior spinous process of the ilium.

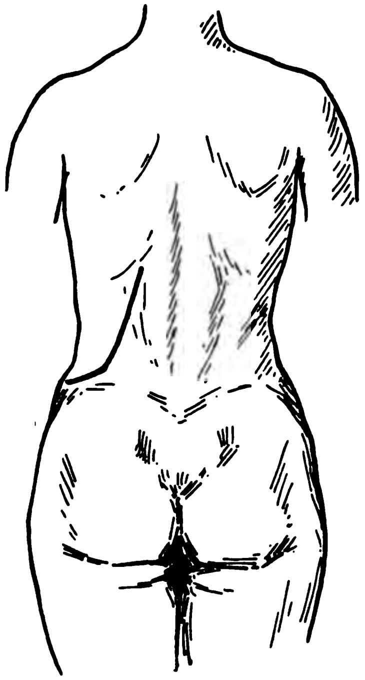


FIG. 160.—(60) LEJARS PROCEDURE FOR EXPLORATION OF THE KIDNEY. The incision extends from the middle of the twelfth rib obliquely downward and outward to the middle of the crest of the ilium.

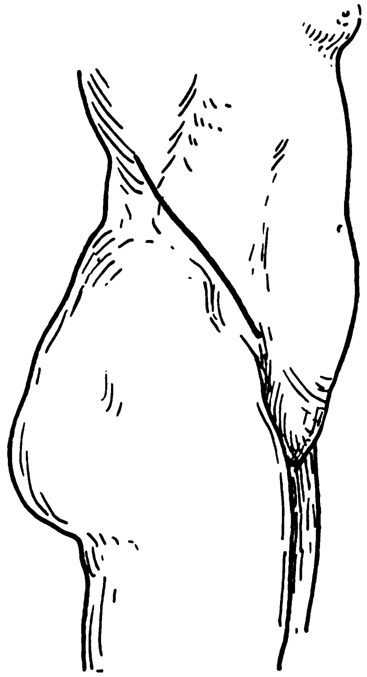


FIG. 161.—(62) ISRAEL PROCEDURE FOR EXPLORATION OF THE KIDNEY. INDICATING LONG LINE OF INCISION.

63. PROCEDURE FOR THE EXTIRPATION OF THE KIDNEY (NEPHRECTOMY) FOR RUPTURE OF THAT ORGAN

(1) Expose the kidney by any of the extraperitoneal procedures just described. As the succeeding steps should be taken quickly the kidney should be exposed by free incision, large enough to admit the hand.

(2) If there is perirenal extravasation the clot should be disregarded for the moment, while the hand is at once thrust to the base of the kidney and the renal vessels secured by a strong curved clamp (Fig. 162).

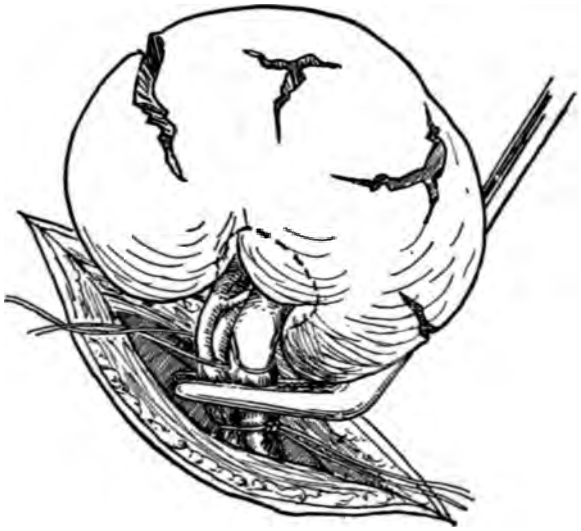


FIG. 162.—(63) PROCEDURE FOR NEPHRECTOMY FOR MULTIPLE RUPTURE OF THE KIDNEY.

(3) All perirenal clots should now be cleaned out, the kidney brought up and carefully inspected.

(4) If there is fresh hemorrhage from under the kidney it is evident that the clamp is not controlling the bleeding point, and another clamp should be applied further down on the pedicle.

(5) (If the rupture is unipolar, and if it is evident that it can be controlled by hemostatic suture of the kidney substance, the kidney itself may be resected.)

(6) If, however, there are multiple "fractures" of the kidney substance, or if it seems to have been crushed and rendered pultaceous, the kidney should be removed. In cutting it away some of the pelvis may be left to serve as a "button," and thus prevent retraction of the pedicle and secondary hemorrhage.

(7) The field of operation should be again cleansed of clots derived from the kidney, and ligatures should be applied below the clamp. In cases of rupture all vessels, including the ureter, may be included in the ligature. A supplementary or safety figure-of-eight ligature may be applied above the clamp. This is important as a precaution against retraction of the pedicle.

(8) The forceps are now removed and the field inspected for evidence of further hemorrhage.

64. PROCEDURE FOR RESECTION OF THE RUPTURED KIDNEY

(1) The kidney, exposed by retroperitoneal incision (q. v. *ante*), is brought up into the field of operation. The traction incident to this manipulation may temporarily arrest an active hemorrhage—a circumstance to be remembered, as the bleeding may begin again when the kidney is dropped back.

(2) The kidney is transfixed with a coarse silver or annealed iron or copper wire passed in the median line, from the end of the pelvis outward 1 cm. back of the injury (Fig. 163).

(3) Then either by a seesaw movement or by an écraseur-like action the kidney substance is cut through obliquely to one side of the injury.

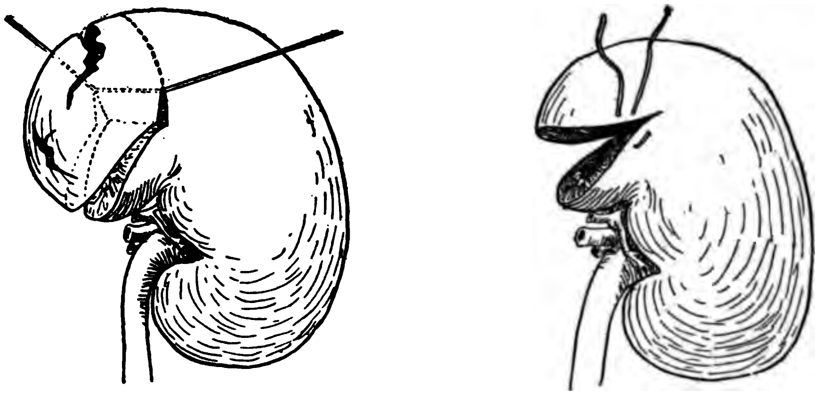


Fig. 163. Fig. 164.

Figs. 163 and 164.—(64) Procedure for Resection of the Kidney for Unipolar Rupture.

Fig. 163.—(a) The wire inserted ready to cut away the injured part of the organ.
Fig. 164.—(b) The V-shaped excision completed, the cavity of the kidney exposed, and one mattress suture inserted preparatory to closure.

(4) Beginning at the same point, a wire cut is made in the same way on the other side of the injury, thus removing a wedge-shaped piece of tissue.

(5) Drop the kidney back into normal position long enough to see whether there is bleeding from some other part of the organ.

(6) The V-shaped space thus left in the end of the kidney is now closed by a series of mattress sutures (Fig. 164).

The object in making the excision by means of a wire is that the surfaces thus left are bloodless.

65. PROCEDURES (DIVERSE) FOR HEMOSTASIS OF RUPTURED KIDNEY

Minor excisions of kidney substance may be all that are required. In such cases Lejars utilizes an interrupted suture (Fig. 165). I have, however, found the continuous hemostatic suture (Fig. 166) more satisfactory, both in the safety of its application and in the efficiency with which it approximates the parts and controls hemorrhage.

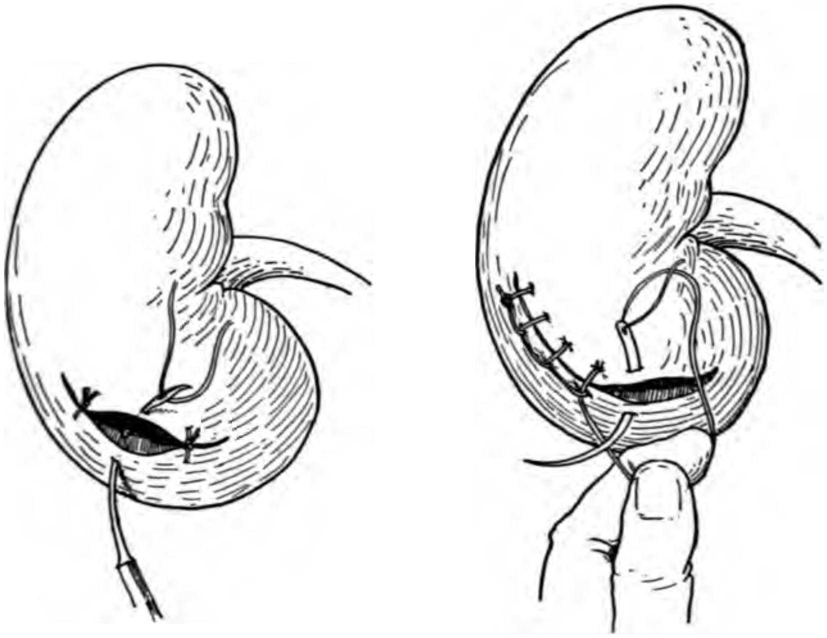


FIG. 165. FIG. 166.

FIGS. 165 AND 166.—(65) PROCEDURE FOR HEMOSTASIS OF RUPTURED KIDNEY.
FIG. 165.—(a) Simple interrupted suture. (After Lejars.)
FIG. 166.—(b) Author's continuous hemostatic suture.

CHAPTER XI

INJURIES OF THE RECTUM

Injuries of the rectum from external violence are not of frequent occurrence. The sphincter ani muscle has been permanently injured and the rectum torn by the accidental introduction of the midwife's finger while making an examination in a breech delivery. All sodomists have sustained more or less injury to the rectum. The introduction of foreign bodies often causes laceration of the mucosa, even the use of the rectal syringe having caused annoying injury. McRae records 103 cases of gunshot wounds of the rectum, of which 44 died. Of the whole number 34 were complicated with wounds of the bladder, resulting in 4 deaths. The most frequent cause of injury is among children falling upon a picket fence, thus lacerating the anal structures. I have had two cases of this sort, one splitting up the anococcygeal ligament nearly to the coccyx.

Symptoms and Diagnosis.—Permanent paralysis of the sphincter ani muscle from subcutaneous laceration due to over distention, as from digital divulsion in parturition, or from pederasty in young subjects, may defy detection at the time the condition is induced. It is, of course, difficult in such cases to get a history that will throw light upon the real condition. In cases of gunshot wounds and of lacerations the history of injury, present or remote, is of extreme value. In gunshot wounds communicating with the rectum above the sphincter, gas and possibly the feces escape through the external wound while the blood from the injury escapes chiefly into the rectum. In lacerations from falling upon some sharp body the wound is immediately in evidence; later a cicatricial area covers the wound. Fecal incontinence is an evidence that the sphincter ani muscle has been divided. In cases of long standing the ends of the retracted sphincter muscle are indicated by a dimple-like depression posteriorly and laterally to the anal orifice.

Treatment.—*Gunshot wounds of the rectum* have a tendency to heal spontaneously. This tendency can be promoted by having the patient wear a low rectal tube constantly for a couple of weeks, thus enabling the gas and feces to escape *per anum* without resistance, and consequently without being diverted through the wound. Operation for fistula may be required later.

Permanent paralysis of the sphincter ani muscle, if existing from birth, is suggestive of congenital absence of the muscle, a condition that has so far been unobserved. If acquired during childhood the condition should lead to the closest inquiry as to whether the patient has been the victim of criminal assault. In either event, the sphincter not having been divided, it does not declare its presence by umbilication.

Under such circumstances exploration should be made in an effort to discover the remnants of the sphincter and, if possible, to restore the muscle. The author has had a case of this kind, the result of criminal assault, in which an excellent result was realized. The method of procedure was essentially that which next follows.

66. PROCEDURE FOR RESTORATION OF THE SPHINCTER ANI MUSCLE ("RETROANAL TEAR")

(1) A semilunar flap is raised, care being taken that its ends are well outside the dimples caused by the retracted ends of the sphincter ani muscle (Fig. 167).

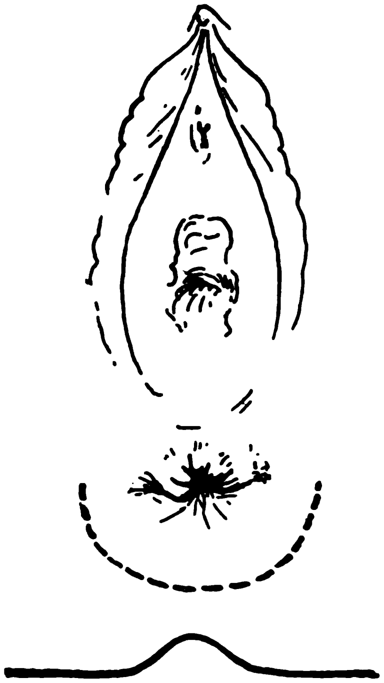


Fig. 167.—(66) Procedure for Restoration of Sphincter Ani Muscle after Retroanal Laceration. (a) The line of incision is shown.

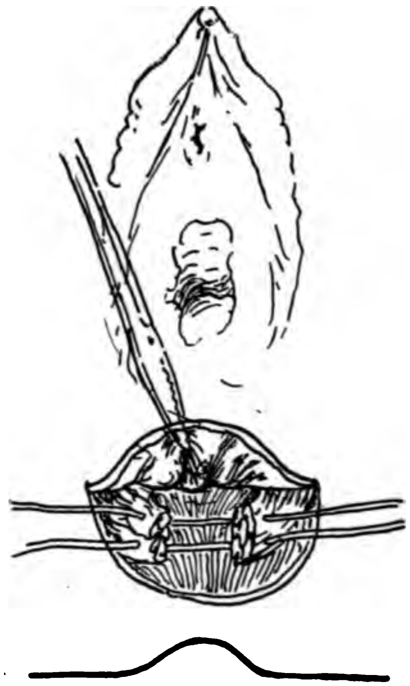


Fig. 168.—(66) Procedure for Restoration of Sphincter Ani Muscle after Retroanal Laceration. (b) The ends of the muscle are isolated and transfixed with two sutures.

(2) The flap is elevated and the now exposed ends of the muscle are transfixed by two approximation sutures of chromicized catgut (Fig. 168).

(3) The approximation sutures are tied and fortified with a sling or mattress suture of silkworm gut from each side (Fig. 169).

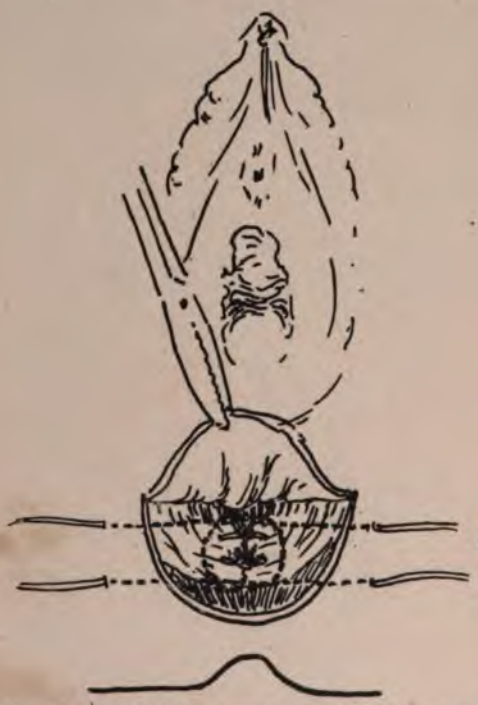


Fig. 169.—(66) Procedure for Restoration of Sphincter Ani Muscle after Retroanal Laceration. (c) The sutures in the ends of the muscles are tied and the approximation fortified by two mattress sutures.

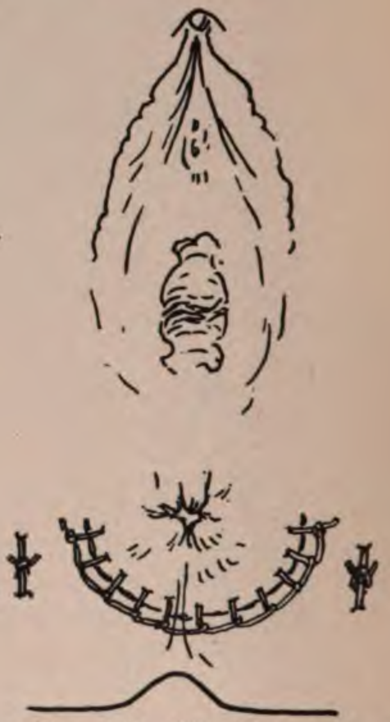


Fig. 170.—(66) Procedure for Restoration of Sphincter Ani Muscle after Retroanal Laceration. (d) The mattress sutures are tied at each side and the retroanal flap sutured back into place.

(4) The flap is restored by interrupted sutures, and the two mattress sutures are tied at the side (Fig. 170).

The essential principle of this procedure is the raising of the flap, and thus excluding the rectum from all communication with the field of operation. The same principle is applied when the laceration is anterior to the anus (see Laceration of the Perineum).

SECTION III

DISPLACEMENTS

CHAPTER I

DISPLACEMENTS OF THE VAGINA

There is a displacement of the vaginal walls in urethrocele, cystocele, rectocele, and in descensus of the uterus. In each of these instances the displacement exists essentially in respectively the urethra, the bladder, the rectum, and the uterus. There is, therefore, some reason why the subjects should be treated under displacements of the organs mentioned. This is especially true of displacements of the uterus. In the other two instances, however, so much of the pathology and so much, practically all, of the reparative surgery are connected with the vaginal wall that the conditions will be treated from that standpoint.

URETHROCELE

This is a condition in which there is a sacculation of the urethral mucosa with a corresponding distortion of the vaginal wall. It is generally the result of parturition and is usually associated with laceration of the perineum.

Symptoms and Diagnosis.—The condition causes retention of urine in the saccules, whence it dribbles in small quantities, but enough to keep up annoying moisture with a urinous odor and excoriation of the vulva. A chronic urethritis with painful urination is often developed. Careful physical examination will generally show sacculation on the vaginal wall (Fig. 171), while exploration with the sound, sharply curved at the tip, will locate the saccules.

Treatment.—This condition, which is essentially one of redundant urethral mucosa, may be successfully treated by Emmet's buttonhole operation, which was devised more especially to overcome redundancies manifested in prolapse of the urethra (q. v.).

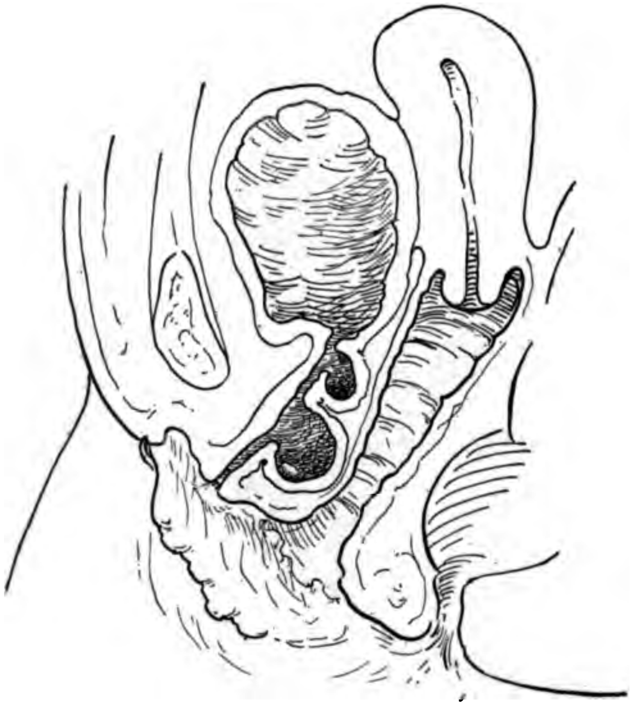


FIG. 171.—URETHROCELE. Two sacculations of the urethra are shown.

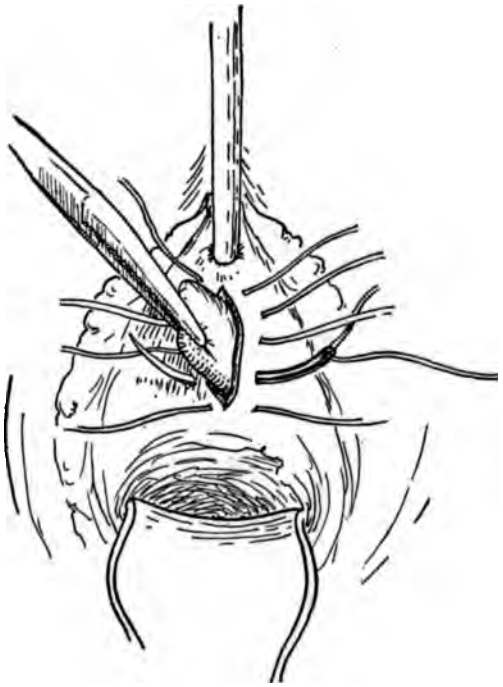


FIG. 172.—(67) EMMET PROCEDURE FOR REDUNDANT URETHRAL MUCOUS MEMBRANE. (After Dudley.)

67. EMMET PROCEDURE FOR URETHROCELE AND FOR PROLAPSE OF THE URETHRA

(1) A large sound is inserted into the bladder and intrusted to an assistant.

(2) An incision as long as the saccule, or equivalent in length to the redundant external mucosa, is made down to, but not through, the urethral mucous membrane.

(3) The urethral mucous membrane is caught by forceps and drawn through the incision.

(4) Sutures are now passed through both the vaginal membrane and the sac formed by the urethral mucosa (Fig. 172).

(5) The urethral mucosa is now cut off and its margins permitted to retract under the margins of the vaginal membrane.

(6) The sutures are now tied, after which the sound is removed.

CYSTOCELE

Cystocele is so called because it is a sacculation of the wall of the bladder into the vagina. It is, therefore, a displacement of the posterior wall of the bladder, carrying with it a corresponding displacement of the anterior wall of the vagina. This conception, true as far as it goes, has unfortunately been too generally accepted as an epitome of the pathology of the condition. This view is not justified by the facts. In the order in which these pathologic changes may develop in a given case they are as follows, viz.:

(a) The pelvic fascia surrounding the vagina and the sphincter vaginæ muscle are weakened, if not actually broken down, by distention and pressure at parturition.

(b) The perineum may or may not be torn, but, most generally, the perineal isthmus of the levator ani is broken down, resulting in relaxed vaginal outlet.

(c) The suspensory apparatus of the uterus is liable to have been weakened by the same cause.

(d) With these several changes as initial factors, there is inaugurated a hernial descensus of the bladder itself. This is shown by

(e) The gradual disappearance of the anterior vaginocervical fold and by the gradual shortening of the exposed portion of the anterior cervical wall. In other words, the gradual descent of the bladder through the separated pelvic fascia gradually changes its relation to the uterus until the fundus of the bladder occupies a level lower than that of the fundus of the uterus (Fig. 177). The condition is, there-

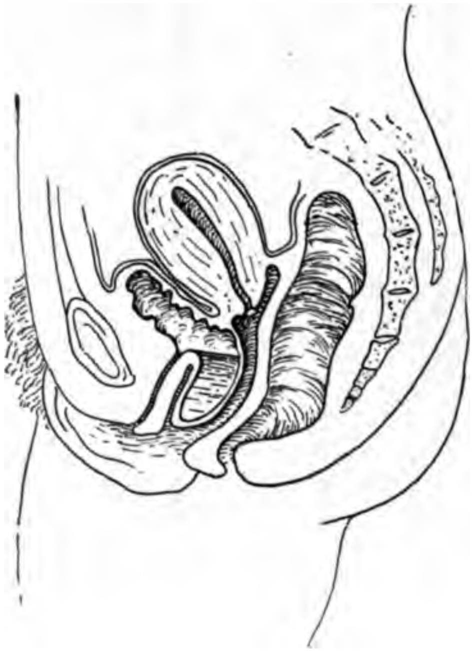


FIG. 173.—CYSTOCELE, SHOWING CYSTIC POUCH FILLED WITH RESIDUAL URINE.

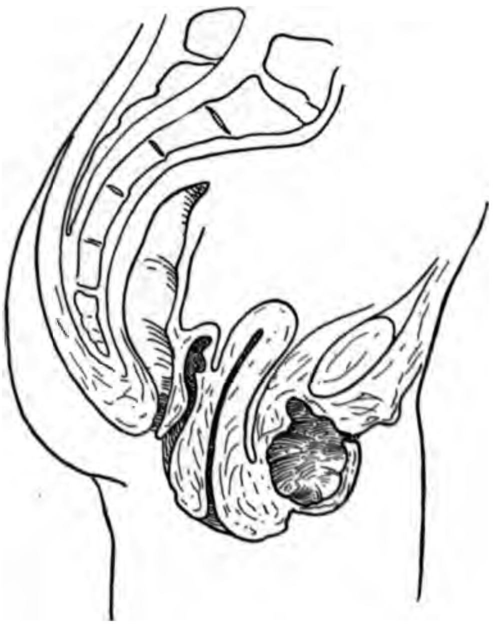


FIG. 174.—PARTIAL PROLAPSE OF THE UTERUS, GREAT HYPERTROPHY OF THE PORTIO VAGINALIS, WITH COMPLETE PROLAPSE OF THE BLADDER.

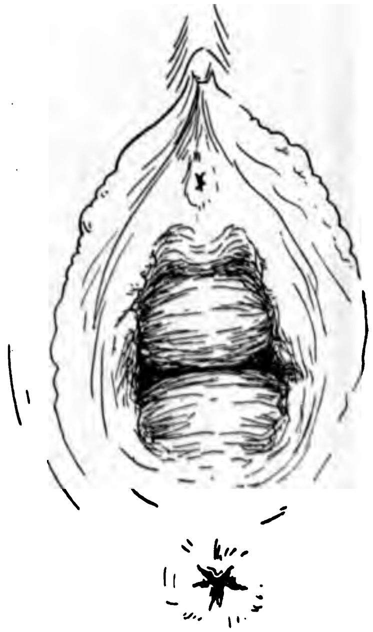


FIG. 175.—LIPS OF THE VULVA RETRACTED REVEALING THE POUCHING BLADDER (CYSTOCELE) ABOVE AND THE POUCHING RECTUM (RECTOCELE) BELOW. (After Van de Poll.)

fore, one of a true hernia, with the bladder as the protruding viscus (Fig. 173). Cystocele is liable to coexist with a similar condition of the uterus (Fig. 174) (see Rectocele). The displacement is further shown by Fig. 175, in which the descent of both the bladder (cystocele) and rectum (rectocele) is made apparent.

Symptoms and Diagnosis.—Cystocele may exist for a long time as a symptomless condition. Finally, however, the descent of the viscus gives rise to discomfort in the back, due to downward traction. There is more or less discomfort in the bladder because of the inability of the patient completely to empty the bladder. In certain cases it is necessary for the patient to introduce her finger into the vagina and lift up the bladder before she can either empty it or urinate at all (Fig. 173). When the patient strains at stool the bladder bulges outside the vulvar orifice. In some cases there is distressing incontinence due to the breaking down of the vesical constrictor. A sound introduced with its point downward can be felt in the protruding pouch (Fig. 176). Perineal retraction will reveal the displaced bladder. Its character and the extent of the displacement can be determined at this time by having the patient either cough or strain downward.

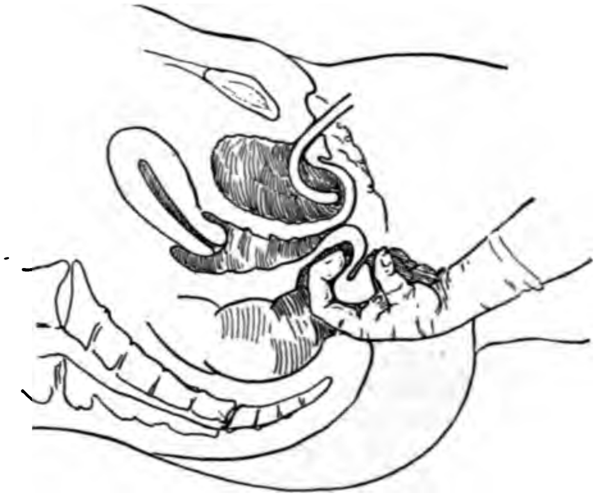


FIG. 176.—THE SOUND IN THE BLADDER DEMONSTRATING THE CYSTOCELE AND THE FINGER IN THE RECTUM DEMONSTRATING THE RECTOCELE.

Treatment.—The treatment of cystocele is *palliative* and *curative*.

Palliative treatment consists in affording the displaced organ some

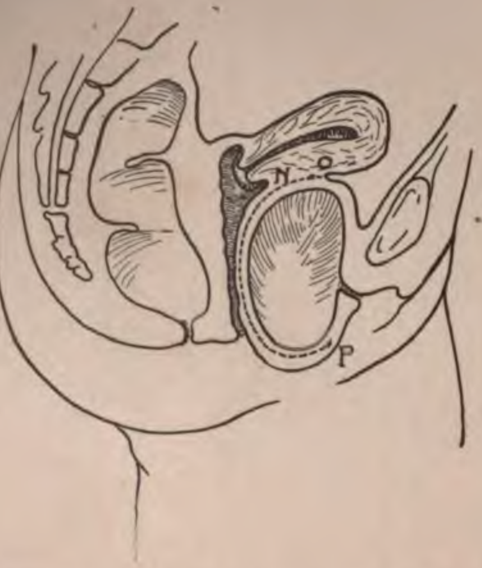


FIG. 177.—(68) GOFFE PROCEDURE FOR REPAIR OF VESICOCELE. (a) The descent of the bladder and the pouching into the vagina and through the vulva orifice is shown. The dotted line O.N.P. indicates the line of incision. (After Goffe.)

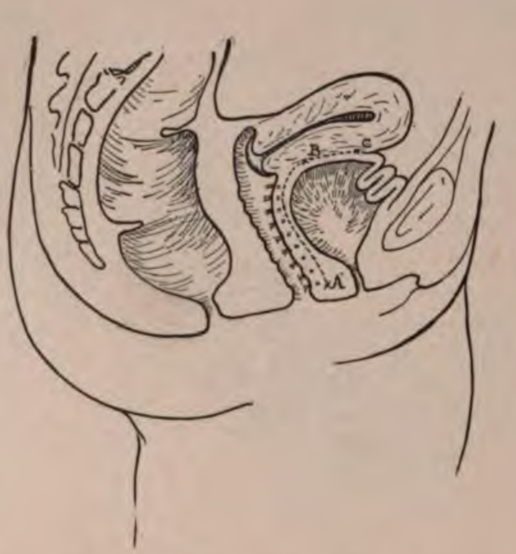


FIG. 178.—(68) GOFFE PROCEDURE FOR REPAIR OF VESICOCELE. (b) The vaginal flap, the dissection of the bladder from the vaginal wall and from the uterus, and the extension of the dissection into the peritoneal cavity, are here shown. In the replacement, point B is to be carried to point C, thus placing the bladder wall on the line A–C. (After Goffe.)

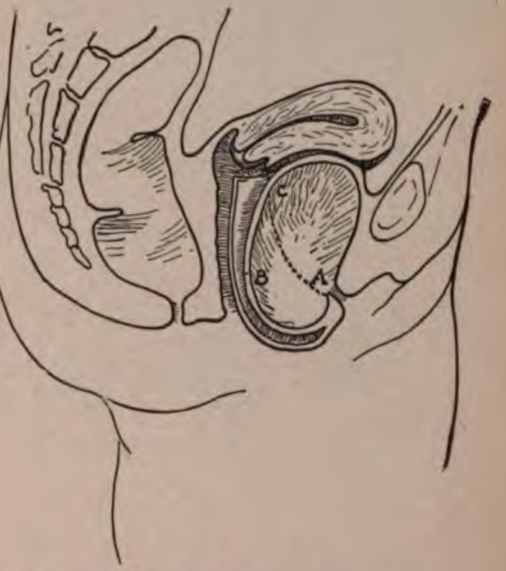


FIG. 179.—(68) GOFFE PROCEDURE FOR REPAIR OF VESICOCELE. (c) The point C indicates the location of the suture that has been inserted at the base of bladder and high up on the uterus and which, when tied, has forced the redundant bladder into distensible folds at the fundus. B and A are the points of fixation sutures. (After Goffe.)

sort of mechanical support. This is done by tampons and pessaries. They naturally are but makeshifts to afford relief for the time being. The same may be said of postural treatment, by which is meant that the patient shall assume the knee-chest posture several minutes at a time several times a day. In this position, with slight perineal retraction, the air rushes into the vagina, and in the absence of adhesions the organs, for the time being, gravitate into their normal positions.

Curative treatment consists in restoring, as nearly as possible, the normal anatomical relations of the parts. This implies that the bladder is to be put back to its normal position, that the pelvic fascia is to be restored to its normal power of support, that redundant tissues are to be removed, and that all natural supports shall be reëstablished. The most rational operation for the purpose is that popularized in this country by Goffe. This procedure, as I practice it, is as follows, viz.:

68. GOFFE PROCEDURE FOR THE CURE OF CYSTOCELE

(1) An incision is made vertically in the anterior wall of the uterus, from the base of the urethra to the cervix (Fig. 177).

(2) A transverse incision—the cross of a T—is made about 5 cm. below the cervix, extending to either fornix of the vagina, both this and the vertical incision extending down to the bladder wall proper (Fig. 178).

(3) The long triangular vaginal flaps thus formed are dissected back, everted, and the bladder dissected away from its connections, not only with the entire anterior vaginal wall, but with the uterus. This dissection is carried up to and through the peritoneum, as in the procedure for vaginal hysterectomy (Fig. 180).

(4) The cervix is drawn up, its denuded surface exposed, and a suture is inserted at the upper or peritoneal margin of the denuded area on the uterine wall.

(5) The outer end of the suture is inserted in the wall of the bladder about 2 cm. from its juncture with the urethra.

(6) This suture is now tied, by which all redundancy of the bladder wall is carried up into the pelvic cavity, and the lower vesical wall is made normally taut. A similar suture is inserted lower down, if deemed necessary (Fig. 179).

(7) The redundant vaginal wall is now cut away by trimming each vaginal flap upward and outward from the lower point of the vertical

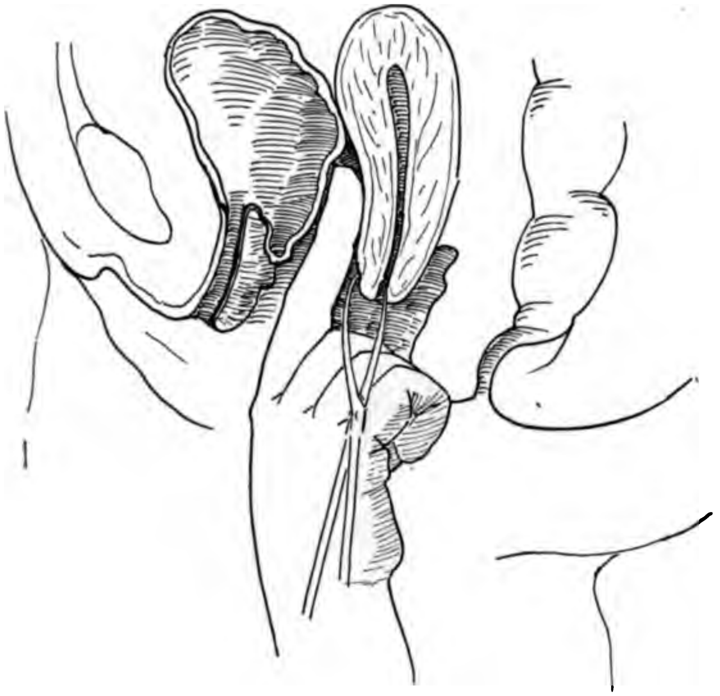


Fig. 180.—(68) Goffe Procedure for Repair of Vesicocele. (d) The method of separating the bladder from the uterus after the preliminary incision has been made.

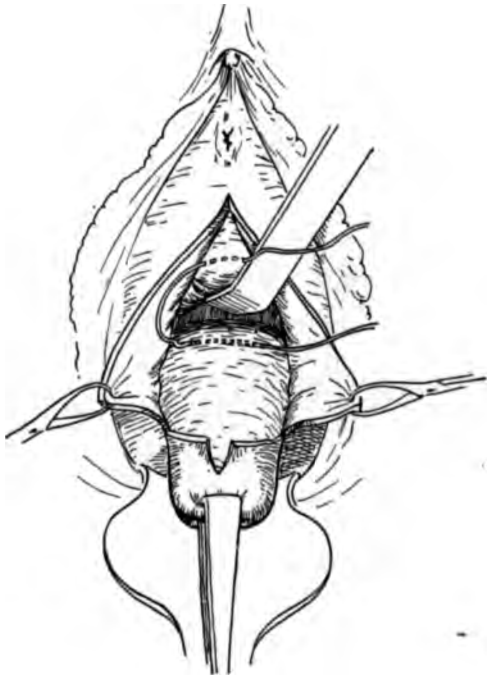


Fig. 181.—(68) Goffe Procedure for Repair of Vesicocele. (e) Author's method of introducing the fixation suture in the base of the bladder and the fundus of the uterus.

incision to the outer point of the transverse incision, or so much of it as may be necessary to make it fit.

(8) The incision is closed by interrupted sutures (Fig. 182).

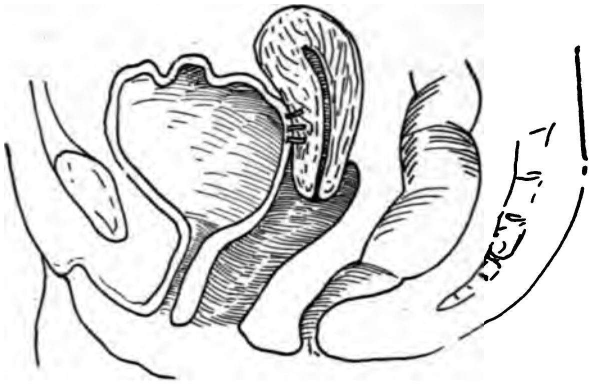


Fig. 182.—(68) **Goffe Procedure for Repair of Vesicocele.** (f) Location of the fixation sutures.

My own method of applying the essential fixation suture, i. e., in the base of the bladder and the body of the uterus, is shown in Fig. 181.

69. SUTTON PROCEDURE FOR CYSTOCELE

This procedure contemplates the restoration of the fascia and the infolding of the redundant bladder wall. It is accomplished by the following steps, viz.:

(1) An incision is made through the vaginal membrane around the base of the cervix to the lateral sulci.

(2) From each end of this incision another is carried obliquely inward and forward, the two intersecting at a point near the meatus (Fig. 183).

(3) The mucous membrane marked off by this triangular incision is dissected away in one piece, care being taken to carry the lateral incision through the fascia.

(4) Transverse ligatures are then inserted through the vaginal membrane and fascia on each side to within a little less than 1 cm. of the base line. A single suture is then similarly placed in each lateral angle of the denuded area.

(5) The sutures are then tied, when the approximation will be found to be complete and accurate (Fig. 184).

This procedure has the merit of simplicity, and, in less extensive cases, it is efficient. In all cases it must result in some diminution of

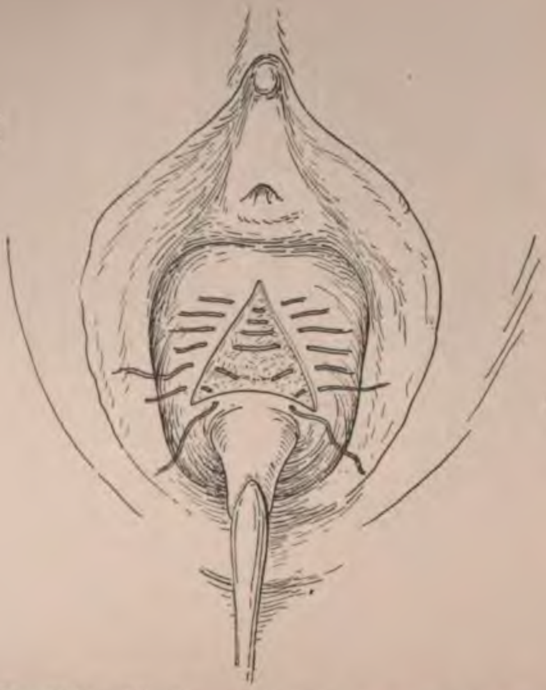


FIG. 183.—(69) SUTTON PROCEDURE FOR REPAIR OF CYSTOCELE. (a) The denudation has been made and interrupted sutures inserted.

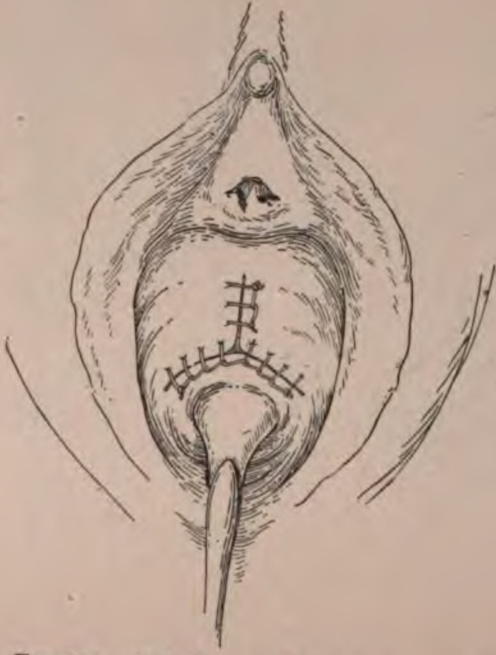


FIG. 184.—(69) SUTTON PROCEDURE FOR REPAIR OF CYSTOCELE. (b) Closure by continuous hemostatic suture.

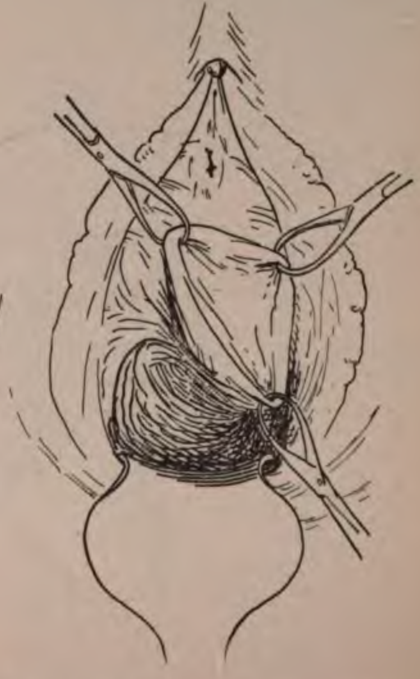


FIG. 185.—(70) HIRST PROCEDURE FOR REPAIR OF CYSTOCELE. (a) The three forceps define the area of the left sulcus to be denuded, the right to be similarly treated.

bladder capacity, as the infolded lower wall becomes fixed. This point may not be a matter of great importance.

70. HIRST PROCEDURE FOR CYSTOCELE

As described by its author, this procedure is as follows:

(1) The anterior vaginal sulcus on the left side is displayed by three bullet forceps, making traction at three angles of the sulcus (Fig. 185).

(As the woman lies in the dorsal position on the table the sulcus is not easily accessible, and cannot conveniently be denuded, as it lies hidden within the vagina; but, by fixing one bullet forceps alongside the orifice of the urethra, another on the opposite vaginal wall, and a third half way up the vaginal wall at the apex of the sulcus, the area involved in the injury comes plainly into view.)

(2) The triangle is marked out with a knife and the mucous membrane is readily dissected off by scissors in one piece, which takes but a minute or two.

(3) The right side is treated in the same way. (Usually the tear is deeper on the left side and the operation may be confined to that side.)

(4) The sulcus being denuded, the sutures of silkworm gut are inserted (Fig. 186). They are not tied at once, but are clamped temporarily with hemostats.

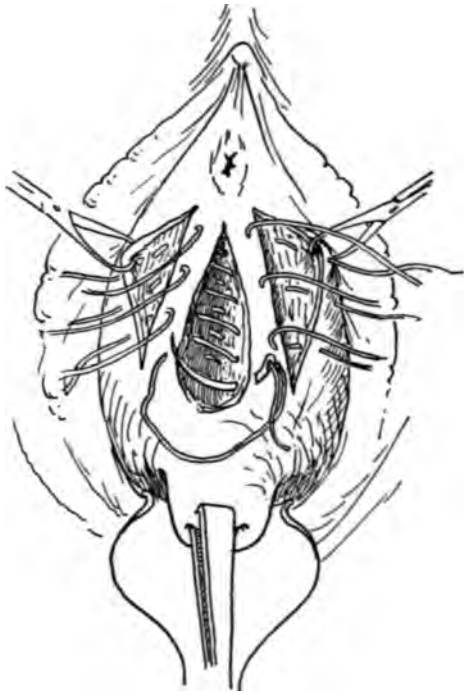


FIG. 186.—(70) HIRST PROCEDURE FOR REPAIR OF CYSTOCELE. (b) The denuded sulci with interrupted sutures adjusted and the denuded area in process of being closed by laminated suture.

(5) The cervix is pulled out of the vulva and the rest of the operation is performed in the usual manner for cystocele, with an oval denudation and the buried continuous tier suture of catgut.

(6) After the closure of the oval denudation, the sulci sutures are united with shot.

71. THE PURSE-STRING PROCEDURE FOR CYSTOCELE

(1) Denude a wide circular area through the vaginal membrane and the fascia.

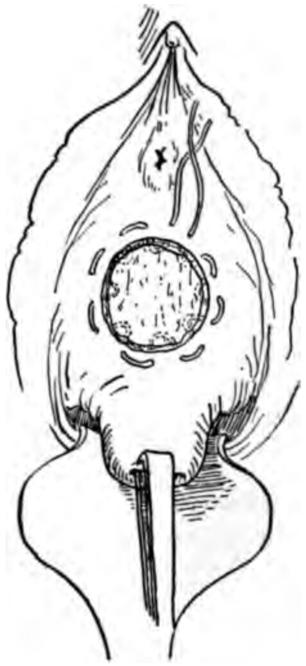


FIG. 187.—(71) PURSE-STRING PROCEDURE FOR REPAIR OF CYSTOCELE. Note that each dip of the suture is made to embrace both the vaginal membrane and the fascia.

(2) Insert a continuous purse-string suture through the vaginal membrane and the fascia, entirely around the denuded area (Fig. 187).

(3) Draw the flaps shut and tie the suture.

72. PROCEDURE FOR RESTORATION OF THE BLADDER WALL IN CYSTOCELE, OCCURRING AS A COMPLICATION OF COMPLETE PROLAPSE OF THE UTERUS

(1) Determine the limit of the bladder by introducing a catheter or sound (Fig. 188).

(2) Denude the exposed vesical surface by removing an ellipse of tissue down to but not through the mucosa, care being taken to expose, if possible, the margins of the fascia on either side of the operation wound.

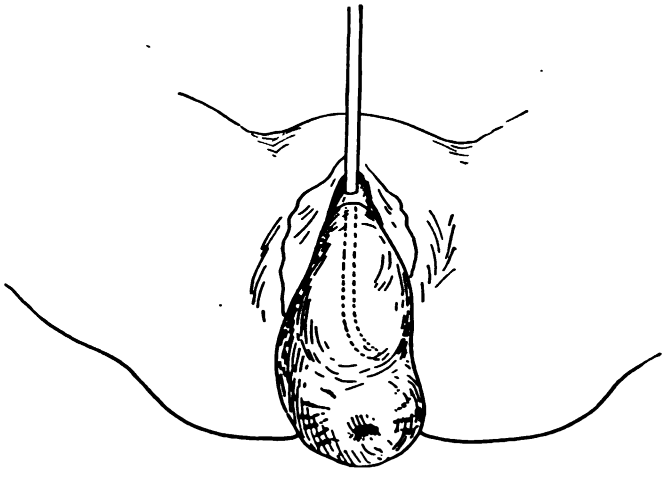


FIG. 188.—DEMONSTRATION BY CATHETER OF CYSTOCELE WITH COMPLETE PROLAPSE OF THE UTERUS. (After Van de Poll.)

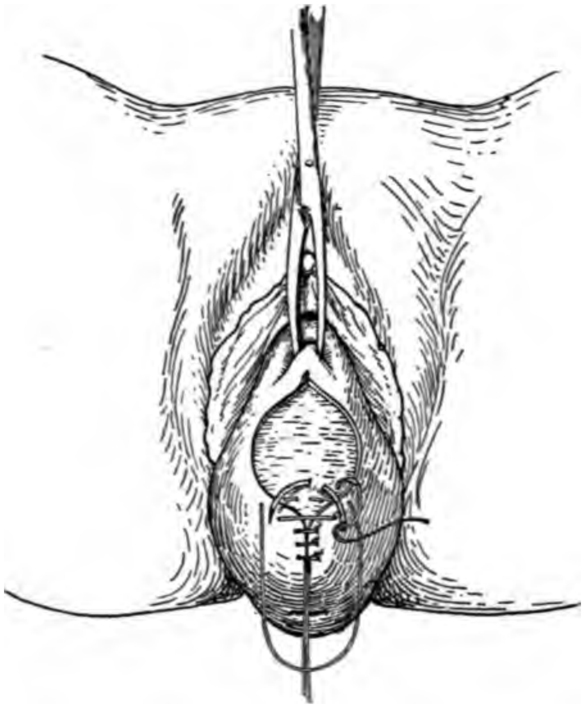


FIG. 189.—(72) PRELIMINARY RESTORATION OF THE BLADDER WALL BEFORE OPERATION FOR PROLAPSE. (The Goffe Procedure would be preferable.) (After Van de Poll.)

(3) Close the wound with continuous chromicized catgut suture, inserted through the margins of the wound and picking up the mucosa by passing through the exposed connective tissue in the median line (Fig. 189) or interrupted sutures of silkworm gut may be employed (Fig. 190).

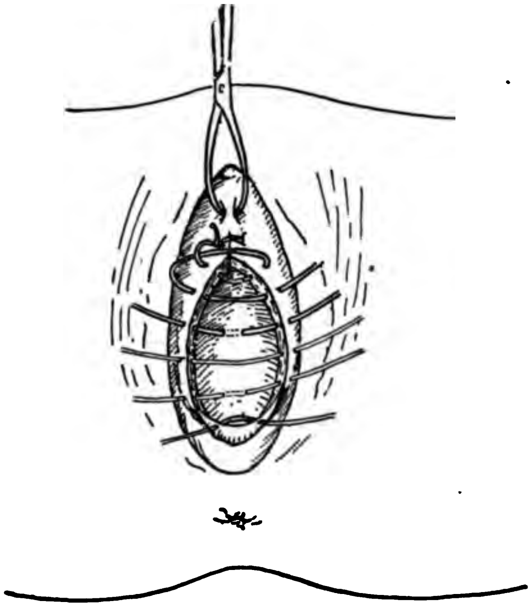


Fig. 190.—(72) Boursier Procedure of Anterior Colpohysteropexie. The dissection is here shown. (After Le Dentur Pictevin.)

(4) In certain cases of complete prolapse it may be better to separate the bladder from the uterus and then finish the operation by resecting the redundant vaginal wall and coapting the margins by interrupted sutures.

(5) Permanent reposition of the uterus is to be effected by shortening the round ligaments (q. v.) and, in presence of lacerated perineum, by repairing that structure (q. v.).

The post-operative treatment of these cases, whatever procedure may have been adopted for the correction of the cystocele, consists in protecting the field of operation from infection, and maintaining rest of the parts during the period of about ten days involved in the process of healing. Douches should be given twice daily. The patient should be catheterized. If she voids urine while on her back some of it is liable to trickle into and infect the vagina. The bowels should be kept gently relaxed and the rectum unloaded by low enemata and the rectal tube kept in to avoid straining. The sutures should be removed in from seven to ten days.

DISPLACEMENT OF THE POSTERIOR WALL OF THE VAGINA

(*Anterior Rectocele*)

This condition, like cystocele, is not, strictly speaking, a vaginal displacement. It is susceptible of classification as a displacement of the rectum. There are, however, so many of the initial or causative conditions, and so many of the consequences connected with the vagina and perineum, and the means of repair are so exclusively on the vaginal side of the septum, that the subject is presented in this connection.

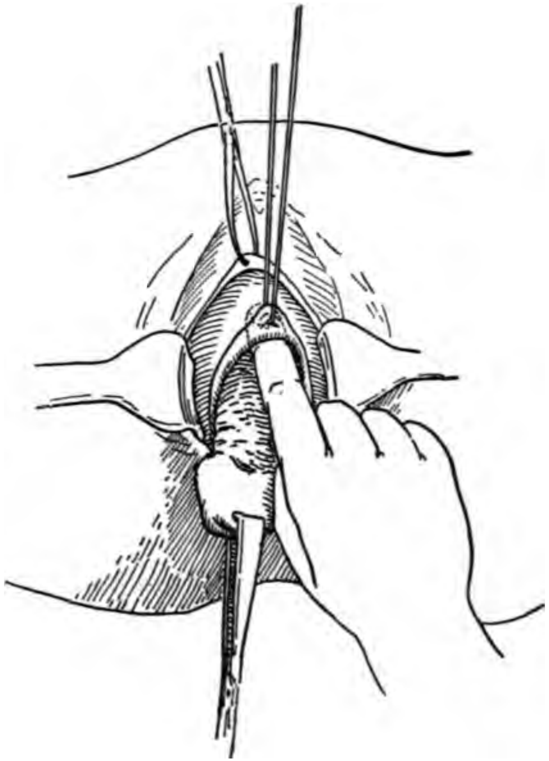


FIG. 191.—(72) METHOD OF CLOSURE.

Anterior rectocele is so called because it implies a forward bulging or hernial protrusion of the anterior rectal wall, as distinguished from a retroanal sacculation of the posterior rectal wall, a condition properly designated as *posterior rectocele* (q. v.).

Anterior rectocele generally occurs in connection with cystocele

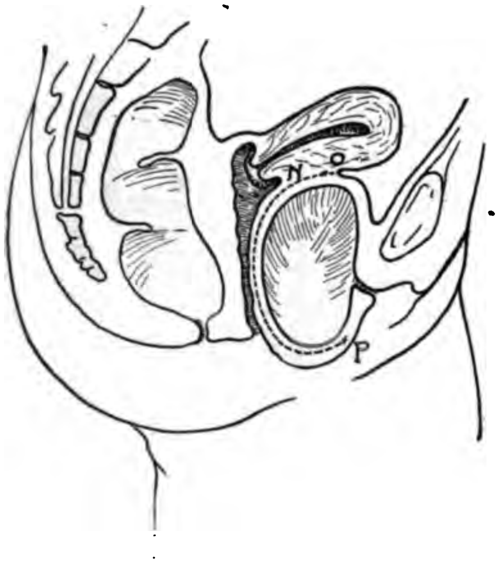


Fig. 177.—(68) Goffe Procedure for Repair of Vesicocele. (a) The descent of the bladder and the pouching into the vagina and through the vulva orifice is shown. The dotted line O.N.P. indicates the line of incision. (After Goffe.)

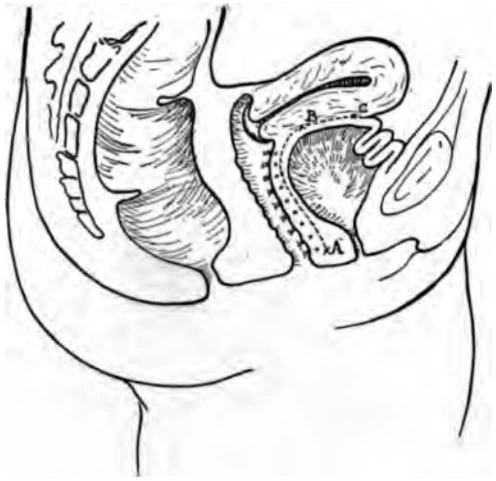


Fig. 178.—(68) Goffe Procedure for Repair of Vesicocele. (b) The vaginal flap, the dissection of the bladder from the vaginal wall and from the uterus, and the extension of the dissection into the peritoneal cavity, are here shown. In the replacement, point B is to be carried to point C, thus placing the bladder wall on the line A–C. (After Goffe.)

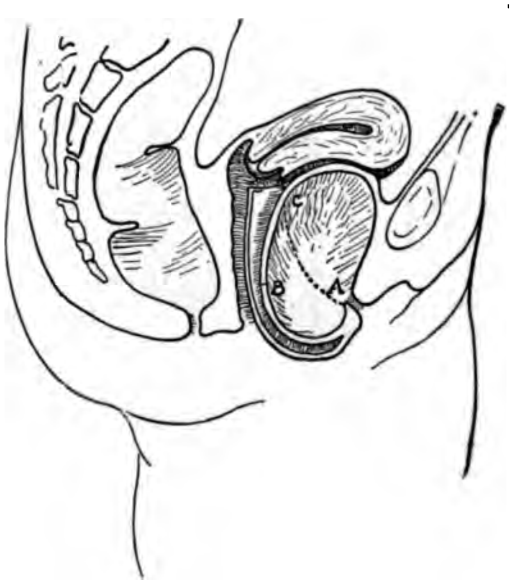


Fig. 179.—(68) Goffe Procedure for Repair of Vesicocele. (c) The point C indicates the location of the suture that has been inserted at the base of bladder and high up on the uterus and which, when tied, has forced the redundant bladder into distensible folds at the fundus. B and A are the points of fixation sutures. (After Goffe.)

sort of mechanical support. This is done by tampons and pessaries. They naturally are but makeshifts to afford relief for the time being. The same may be said of postural treatment, by which is meant that the patient shall assume the knee-chest posture several minutes at a time several times a day. In this position, with slight perineal retraction, the air rushes into the vagina, and in the absence of adhesions the organs, for the time being, gravitate into their normal positions.

Curative treatment consists in restoring, as nearly as possible, the normal anatomical relations of the parts. This implies that the bladder is to be put back to its normal position, that the pelvic fascia is to be restored to its normal power of support, that redundant tissues are to be removed, and that all natural supports shall be reëstablished. The most rational operation for the purpose is that popularized in this country by Goffe. This procedure, as I practice it, is as follows, viz.:

68. GOFFE PROCEDURE FOR THE CURE OF CYSTOCELE

(1) An incision is made vertically in the anterior wall of the uterus, from the base of the urethra to the cervix (Fig. 177).

(2) A transverse incision—the cross of a T—is made about 5 cm. below the cervix, extending to either fornix of the vagina, both this and the vertical incision extending down to the bladder wall proper (Fig. 178).

(3) The long triangular vaginal flaps thus formed are dissected back, everted, and the bladder dissected away from its connections, not only with the entire anterior vaginal wall, but with the uterus. This dissection is carried up to and through the peritoneum, as in the procedure for vaginal hysterectomy (Fig. 180).

(4) The cervix is drawn up, its denuded surface exposed, and a suture is inserted at the upper or peritoneal margin of the denuded area on the uterine wall.

(5) The outer end of the suture is inserted in the wall of the bladder about 2 cm. from its juncture with the urethra.

(6) This suture is now tied, by which all redundancy of the bladder wall is carried up into the pelvic cavity, and the lower vesical wall is made normally taut. A similar suture is inserted lower down, if deemed necessary (Fig. 179).

(7) The redundant vaginal wall is now cut away by trimming each vaginal flap upward and outward from the lower point of the vertical

CHAPTER II

DISPLACEMENTS OF THE UTERUS

Displacements of the uterus in general are divisible into versions and flexions. A version consists of a deviation of the entire uterus from its normal axis; a flexion need be a deviation of only a part of the uterus from its normal axis. As a matter of fact, however, when the uterus is bent upon itself, as in flexion, all parts of the organ are in varying degrees out of line with its normal axis.

These displacements are further divided according to the direction in which the uterus deviates from its normal axis, viz.:

(a) Forward or anteflexions and anteversions.
(b) Backward or retroflexions and retroversions.
(c) Laterally or lateroflexions and lateroversions.
(d) Downward or prolapsus or descensus.
(e) Inside out or inversion.

In addition to these recognized displacements the uterus may be displaced upward, as in the instances of large neoplasms and visceral adhesions.

NORMAL POSITION OF THE UTERUS

Displacements of a pathological kind must not be confused with transient deviations that are really physiological. Indeed, the normal position of the uterus can not be indicated by definite lines or specific limitations By the nature of its construction and in consequence of its visceral relations it has a considerable range of mobility. In infantile life its long axis presents but slight deviation from the long axis of the body, while its locus is on a line with the pelvic inlet. In mature life, however, the fundus leans forward to such a degree that the long axis of the uterus lies at right angles with the brim of the pelvis, the change of position amounting to about 45 degrees. There occurs at this time a normal recession of the organ, until its fundus lies a little below a line drawn from the top of the symphysis pubis to the promontory of the sacrum. The distance from this line to the coccyx is about five inches, one-half of which distance is occupied by the uterus in its long axis. The average normal position, as determined by Mills, is about 30 degrees anterior to a line from the tip of the coccyx to the umbilicus, and coincident with a line from the sacrococcygeal articulation to a point in the median line about midway between the umbilicus and the symphysis pubis (Fig. 193). While this definition of the position of the uterus is as nearly correct as can well be stated in words, the fact should be remembered that this organ vacillates both in actual location and relative position. A loaded rectum or sigmoid may force it forward, while in the presence of an empty bowel and a distended bladder the fundus of the uterus is lifted upward and backward. Küstner has emphasized this relatively normal change of position of the uterus (Fig. 194). The uterus being swung in the pelvis by attachments upon either side, the focal points of which are situated laterally in the middle segment, it follows that, when the fundus is moved in one direction, the cervix must move in the opposite direction. Aside from these movements the uterus has, to a certain extent, an up-and-down movement, rhythmical with the respiratory movements of the abdominothoracic diaphragm. It is this movement of the uterus, observable in almost any patient upon the examination table, that renders it more appropriate to designate as the pelvic diaphragm the structures in which the uterus is imbedded, rather than to apply that term to the deep muscular layer of the pelvic floor. These movements are normal, and any change of position within the normal range of activity should not be construed as a departure from the healthy standard. The arc of mobility may vary from 45 to 90 degrees, while, with the rectum and bladder empty and with no undue voluntary pressure from above, the uterus will be found to return to a position approximating that already defined. A uterus may be said to be dis-

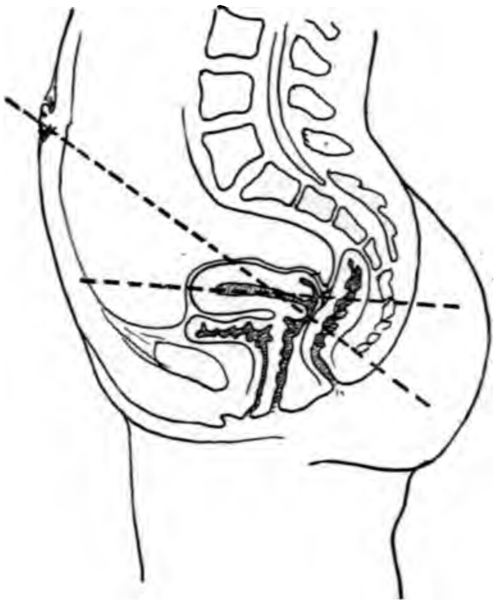


FIG. 193.—THE NORMAL POSITION OF THE UTERUS WITH THE BLADDER AND RECTUM EMPTY AND THE PATIENT IN THE ERECT POSITION.

placed when it ceases to manifest these normal variations of position, and when it persistently remains in a position distinctly at variance with the one which it should occupy under average conditions.

The normal supports of the uterus need to be studied for a proper understanding of various factors engaged in the causation of pathologic displacements. The various anatomic arrangements engaged in holding the uterus in position may be divided into suspensory and supportive. Considering the relative importance of the two classes of anatomic relations, it may be safer to look upon the uterus as a suspended rather than as a supported organ. The suspensory apparatus consists of (a) the peritoneal duplication called the broad ligaments, (b) the round ligaments, (c) the uterosacral ligaments, (d) the attachments to the bladder, and (e) to the structures comprising the floor of the cul-de-sac of Douglas, while (f) the cellular tissue at either side of the uterus is not to be ignored.

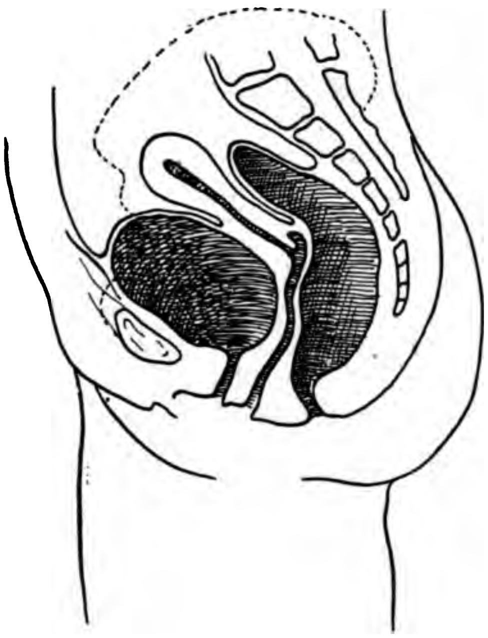


FIG. 194.—THE NORMAL POSITION OF THE UTERUS WHEN THE BLADDER AND RECTUM ARE FULL. (After Kustner.)

The idea that the uterus is supported by a column from below was long ago demonstrated as fallacious by Emmet. A moment's reflection upon the infrauterine structures will convince the reader that they are neither constituted nor arranged to furnish support to the uterus; on the contrary, so far as they tend to exercise a modifying influence upon the position of that organ at all, it is to draw it farther down in the pelvis, rather than to maintain it at its normal level.

It is to be recognized, however, that the vagina, the lower segment of the rectum, and the lower third of the bladder are kept from exercising undue and overpowering traction upon the uterus and its suspensory apparatus by virtue of the supporting influence of the pelvic floor when in a state of integrity.

The pelvic "diaphragm" is not to be confused with the pelvic "floor." The "diaphragm," as the name implies, is that continuity of structure stretching across the pelvis at the level of the intermediate portion of the cervix, as shown by Schroeder (Fig. 195). The floor of the pelvis, as the name implies, is that aggregated structure embracing the perineum found at the outlet of the pelvis.

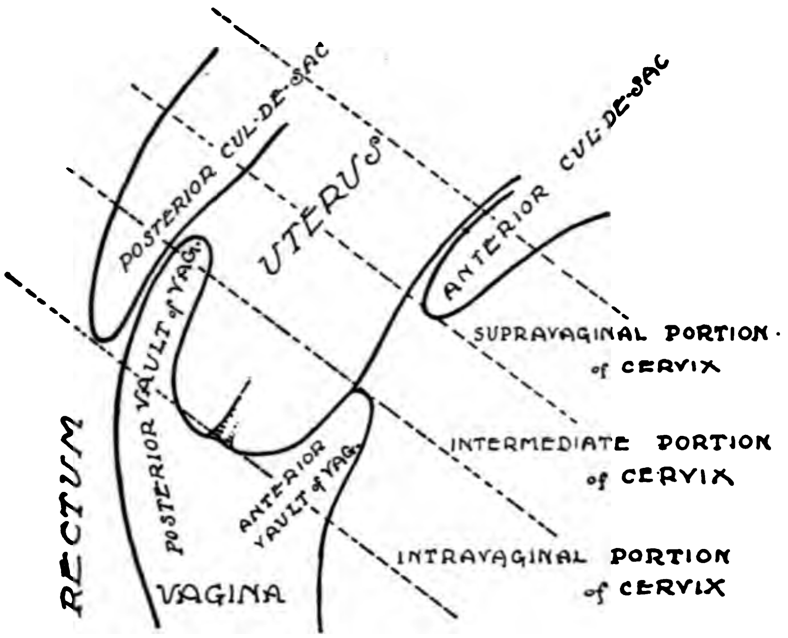

POSTERIOR CUL-DE-SAC
UTERUS
ANTERIOR CUL-DE-SAC
POSTERIOR VAULT of VAG.
SUPRAVAGINAL PORTION of CERVIX
INTERMEDIATE PORTION of CERVIX
ANTERIOR VAULT of VAG.
INTRAVAGINAL PORTION of CERVIX
RECTUM
VAGINA

FIG. 195.—THE PELVIC DIAPHRAGM, SHOWING THE RELATIONS OF STRUCTURES AT THE UTEROVAGINAL JUNCTURE. (After Schroeder.)

The support that is furnished to the uterus from below is derived from the fascia of the pelvic diaphragm rather than from any other structure.

CAUSES OF UTERINE DISPLACEMENTS

The various causes of uterine displacements are to be considered in their relation to abnormal deviations in general, rather than with reference to the operation of a particular cause in producing a particular displacement.

Thus, constipation, by inducing pressure upon the uterus through the direct influence of either a loaded rectum or sigmoid, or by the pressure of the enteroptosis that sometimes causes constipation, forces the uterus downward in the pelvis. Whether the pressure thus exercised exaggerates the preëxisting normal anteversion, or whether it forces the uterus backward into a distinct retrodeviation, depends upon the incidence of coöperative forces. This is illustrated by the downward pressure exercised, as above indicated, at the same time that the uterus is forced backward by a distended bladder, a combination of influences calculated to produce retrodeviation; or the same condition may be induced by having the uterus lifted up by means of a distended bladder, when the patient receives a sudden fall or jumps from a vehicle, landing upon her heels, thus forcing the fundus suddenly below the promontory and into the excavation of the pelvis.

Child-bearing is, perhaps, the most fruitful single cause of uterine displacements. In the parturient act the uterus is subjected to violent influences, which may damage its suspensory apparatus. If the lying-in woman gets up before the womb has had time to shrink, or if she engages in laborious occupation while it is yet heavy, she is very liable to have some form of uterine displacement as a result. In many cases, even after the lapse of considerable time, a remaining subinvolution makes the uterus so heavy that it is thereby forced out of its normal poise.

Occupation, particularly those employments that involve the lifting or carrying of heavy burdens, or that necessitate overhead work or much stair-climbing, tend to force the womb out of position. Malpositions of the uterus are very common among young women employed in shops and factories, where long hours of standing are necessary. Pelvic inflammations, particularly cases of metritis of puerperal origin and of Fallopian tube infection, resulting in pelvic exudations and consequent adhesions, are a fruitful source of displacements.

One of the most fruitful causes of uterine displacement is the antecedent condition of enteroptosis. This state of intestinal displacement is often associated with more or less displacement of other abdominal organs, such as the stomach, liver, kidneys, spleen, and pancreas. The force, however, that is superimposed upon the uterus and thus tends to force it downward is derived from the intestines, large and small, in all but extreme cases of general splanchnoptosis (Fig. 196).

A view formerly held almost universally, and still adhered to by some, is that the primary factor in the production of a prolapse of the uterus is the prolapse of the vagina. The latter again is traced back to a subinvolution following the puerperium. This opinion is contested by Küstner, who has studied the subject extensively. This author holds that it is impossible that a uterus normal in position can be forced out of the pelvis into the vagina. As long as the uterus is in its normal anteroflexio position abdominal pressure acts upon its posterior wall and presses the body upon the bladder. The *portio vaginalis* under increased abdominal pressure has a tendency to rise, if anything. When, however, the uterus is in a retroverted-retroflexed position its vaginal portion becomes dislocated in the direction of the symphysis pubis and moves at the same time nearer the pelvic outlet. The uterus and its cervix now lie so that their axis has the same direction with or forms the continuation of the axis of the vagina. Increased intra-abdominal pressure can now easily force down the uterus into the vagina, this being made still easier since in retroversioflexio the vaginal portion of the cervix is nearer the pelvic outlet than under normal conditions. It is quite common that a history of retroversioflexio can be obtained in cases of prolapsus. The reason this condition is most frequently found among women in the lower walks of life is easily explained. Women of the better classes, as a rule, when retroversioflexio leads to any symptoms, seek medical aid and receive the proper attention. Women who have to work hard for a living often find no time to consult the physician, and, even if they do, they cannot submit to the proper treatment and regimen to correct the retroversioflexio. If this goes on uncorrected, and the woman suffering from it is performing hard physical work, the constant exertions and the persistent abdominal strain in consequence thereof will, in a large percentage of cases, force down the uterus and produce descensus and prolapsus. There are also some cases, however, in which the causation of the affection may be different.

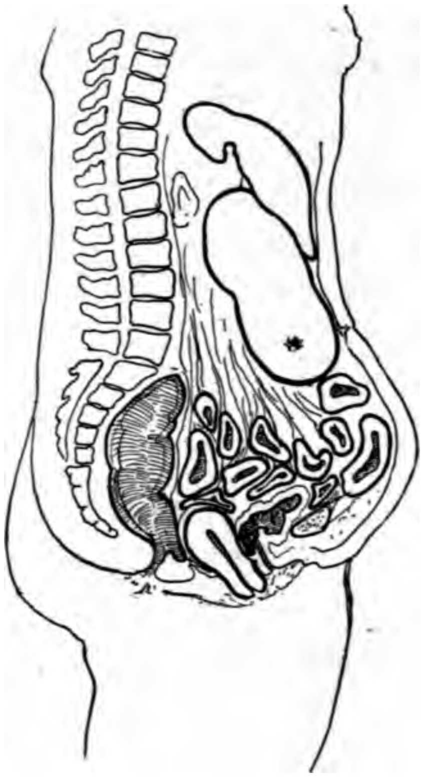


Fig. 196.—The Influence of Gastrocoloenteroptosis in Forcing Downward Displacement of the Pelvic Organs.

If after childbirth the vulva remains gaping for too long a time there may occur a prolapse of the anterior vaginal wall, even if the uterus is not in retroversioflexio, and this may be followed by prolapse induced by the persistent traction upon the uterus and its ligament. Prolapse may be preceded and caused by extensive untreated perineal lacerations, the mechanism of causation being the same as just indicated. Another set of conditions which may bring about prolapse is senile changes of the genitalia, accompanied by atrophy of muscular and disappearance of adipose tissue. A factor which may greatly hasten the establishment of an extensive prolapse, if the other conditions are favorable, is great increase in the intraabdominal pressure in consequence of large pelvic tumors or ascitic accumulations. In prolapse of the uterus there is, of course, a prolapse of the vagina. The upper part of the latter is either invaginated into the lower part, or the whole of the vagina lies inverted in front of the vulva. Total prolapsus uteri, however, does not always mean total prolapse of the vagina, and *vice versa.* Combined with the uterine prolapse there is present a displacement of the bladder (cystocele) and of the urethra. Rectocele may be present, but is usually absent.

PATHOLOGY OF UTERINE DISPLACEMENTS

The changes that ensue on the first departure of a permanent character from the normal poise of the uterus are various; thus, in the case of a retrodeviation, the fundus drops backward into the cul-de-sac, in a position of either *version* or *flexion.* In either of them, in the presence of more or less acute inflammation of the pelvic peritoneum, adhesion is likely to occur. The altered position of the uterus with the consequent interference with the circulation, particularly on the venous side, results in a mechanical engorgement of the organ. The turgescence results in enlargement, increased weight, with more or less edema, and, in some cases of long standing, hyperplasia. Corresponding changes are also manifested in the endometrium, which, at the menstrual epoch, is liable to become hemorrhagic, with a constant tendency to more or less metrorrhagia. When the displacement is associated with flexion interesting changes take place at the point at which the organ is bent. On its under or concave surface there occurs an amount of pressure, varying according to the degree of angulation, upon the bent and approximated surfaces, that sooner or later induces atrophy of the posterior uterine wall at that point. While these changes are occurring on the concave side of the uterus opposite changes are noticeable on the upper or convex side, where the tissues, instead of being subjected to abnormal pressure, are in a state of unnatural tension. The anterior or upper wall, yielding to this tension, presently manifests appearances of compensatory hyperplastic development; the result is a thinned, relatively attenuated, uterine wall on the one (concave) side, as opposed to the elongated and redundant wall on the other (convex) side. These are the cases that are persistent, even in the absence of adhesions (Fig. 197).

When uterine displacement has followed upon a puerperal metritis there seems to have occurred more or less fatty degeneration, with consequent loss of tone of the uterine parenchyma and resulting abnormal flexibility of the uterus, particularly at the cervicocorporeal juncture. In these cases the uterus may be found in a state of anteflexion one day, while the next day the surgeon will find the fundus in the cul-de-sac. Coincidentally with these changes others equally marked occur in the uterine ligaments. In many cases associated with intrapelvic infections it may be accepted as true that the loss of tone, due to inflammatory disturbances in the ligaments themselves, constitutes the initial change in the development of uterine displacements; but, whether causal or sequent, relaxation with elongation of the ligaments sooner or later occurs. The uterosacral ligaments, normally taut, become distinctly relaxed, permitting the cervix to go forward, while the round ligaments become stretched and permit the fundus to drop backward; or the broad ligaments, the seat of an infiltration, cease to exercise control over the poise of the uterus. While these changes, essentially inflammatory in character, permit abnormal mobility of the uterus, it is to be remembered that sooner or later occur, in structures containing considerable connective-tissue elements, those contractions which ensue upon the absorption of inflammatory products. The essentially atrophic changes in this stage of the inflammatory process result in contractions more or less marked in all the involved structures except the round ligaments, and productive of more or less distortion of the uterus. If it were imaginable that these changes would occur coincidentally and equally in all the suspensory structures of the uterus, it could be understood that that organ would thereby be drawn back to its normal position and so retained more firmly than before. Un-

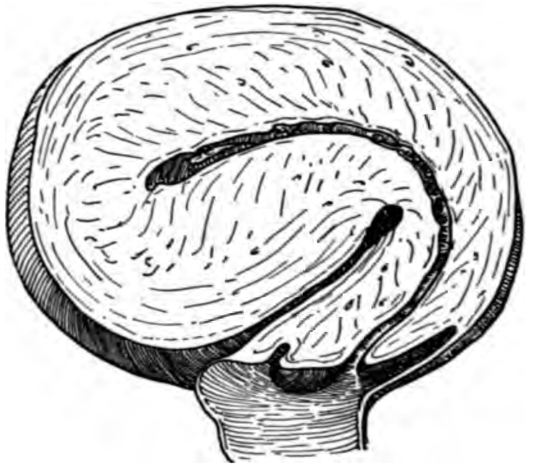


FIG. 197.—ATROPHY OF THE CONCAVE WALL AND THE ELONGATION AND HYPERTROPHY OF THE CONVEX WALL OF A RETROFLEXED UTERUS. The same condition, reversed, may be found in certain cases of retroflexion. (Adapted from Baldy.)

fortunately for such a result, however, the round ligaments do not partake of the contractile changes, while adhesions generally take place by which the fundus becomes anchored in the cul-de-sac, to the wall of the bladder, or to a proximal surface of intestine; or, as too frequently happens, the exudation is so extensive as to involve not only the uterus and the approximated peritoneal surfaces, but also the Fallopian tubes and the ovaries, in the general agglutination. Under these circumstances the resulting inflammatory contraction of any or all of the uterine ligaments can not do otherwise than develop countertraction, causing thereby an intensification of the general intrapelvic distress. Occasionally the inflammatory process with the resulting adhesion occurs on but one side of the pelvis, or, if it occurs on both sides, one side undergoes resolution while the other side shows the mischievous results of exudation, adhesion, and lateral displacement.

In anteversion there frequently exists a condition of hyperplasia and occasionally of neoplastic growth that makes the organ top-heavy, as it were, and acts as a potent cause in producing and maintaining a displacement. In other cases of anteversion parenchymatous changes are sequent rather than causal. When this deviation exists to such a degree as to interfere mechanically with the circulation—particularly on the venous side—more or less passive congestion of the organ results. This is expressed not only in the gross enlargement of the uterus, but in the thickening and excessive epithelial growth of the endometrium. In anteflexion important structural changes are added to those already enumerated. If the angle of flexure is acute, atrophy of the uterine wall occurs at the point of angulation on the concave side, while hypertrophy is likely to occur on the convex side. Contraction of the uterosacral ligaments, whether as a cause or as a consequence, generally exists in connection with forward displacements. It is probably a causative factor in many cases, and one to be taken into account in the treatment. When the uterus is displaced forward in an extreme degree, the fundus of the uterus riding upon the fundus of the bladder, adhesion of the proximal peritoneal surfaces is liable to occur, particularly in the presence of infectious, inflammatory conditions within the pelvis. When this complication exists there is always more or less inflammatory mischief in the wall of the bladder. Extreme antedeviations imply more or less constant tension on the broad ligaments, which sooner or later, yielding to this influence, become relaxed and cease to exercise their function of holding the uterus in its natural poise.

A serious complication of anteversion is sometimes furnished by the condition of pregnancy. In one of my cases the gravid uterus was entirely within the sac of a large ventral hernia (Fig. 198). The patient was successfully delivered per *via naturalis.* Carstens has reported a similar case in which he delivered a fetus, dead forty hours, by Cesarean section, the mother making a prompt recovery.

In descent or prolapsus of the uterus, partial or complete, the pathology differs materially from that in which there exists a mere deviation from the normal axis without descent of the organ below its normal plane. It is, indeed, an open question whether prolapsus of the uterus should be pathologically classified merely as uterine displacement; for, as a matter of fact, the descent of the uterus in the pelvis is but little more than an incident in a series of broader and more comprehensive morbid changes. It is doubtful whether descensus uteri should be considered otherwise than as a feature of a general intrapelvic hernia. The pathology of this condition involves very generally first an enteroptosis, followed by a weakening of the suspensory apparatus of the uterus and a relaxation of the pelvic diaphragm proper, with either a laceration or relaxation of the pelvic floor. The frequent occurrence of descensus uteri in women who have never borne children, or who have never sustained sexual relations, indicates that this form of hernia frequently occurs independently of puerperal conditions. It may be held as true, however, that in the majority of cases the impairment of all the structures involved in this condition is due to the accidents of childbirth. The exercise of undue force, involuntary, manipulative, or instrumental, may have done serious damage to the suspensory apparatus; or the undue distention of the cervix, resulting in its laceration or in the laceration of the circumuterine or perimetric fascia, or in damage to the floor of the pelvis, may have laid the foundation for this form of visceral descensus. Injuries to the floor of the pelvis alone, if permitted to persist, may induce within the pelvis changes that will permit the descent of its contents. This occurs from the widening of the vaginal outlet, permitting the vaginal walls, the rectum, and the bladder to descend and to exercise undue

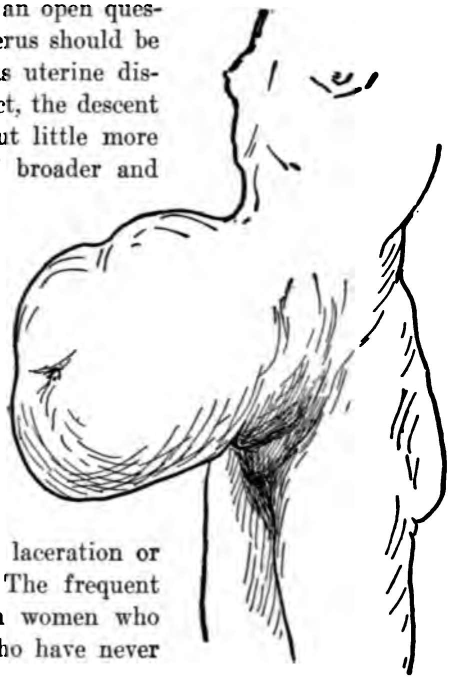


FIG. 198.—ANTERIOR DISPLACEMENT OF THE UTERUS. The author's case in which the entire gravid uterus was in the hernial sac.

and finally overpowering traction upon the uterus and its normal attachments. It thus happens that injuries to the pelvic floor may be the primary and causal condition. The changes incident to prolapse vary according to the degree of descent. Those in the lining of the inverted vagina are very marked. Herzog states that the epithelia become dry and horny. In some places the epithelial covering is thickened, while in others, particularly in the neighborhood of the external os of the cervix, it becomes thinned out and is entirely lost, so that ulcerations appear in this neighborhood.

These changes are due to the fact that the inverted vagina is no longer moistened by the cervical secretion, but is exposed to the air and subjected to other insults. The ulcerations frequently show sharp margins, or they present clefts caused by traction upon the prolapsed parts. It is most marked at the portio vaginalis uteri, but is also well seen in the supravaginal portion. The cervix as a whole is often greatly elongated and thickened in its anteroposterior and lateral diameters (Fig. 199).

The uterine body is likewise enlarged, though proportionately to a lesser degree.

In women advanced in years the enlargement of the corpus may be very insignificant or even absent. In such cases the enlargement of the uterus is, however, not so much due to a true hypertrophy as to an extensive edema caused by circulatory disturbances. That this is indeed the case is proved by the observation that after reposition of the organ its size is often materially decreased in a very short time. The mucous membrane of the uterus in prolapse is thick and succulent, and there occurs not infrequently an endometritis glandularis hypertrophica. The higher degrees of prolapse being usually combined with prolapse of the bladder, this organ likewise shows morbid changes, such as catarrhal inflammation of the vesical mucous membrane or inflammation of the muscular coat, which may even lead to destructive processes. The vesical inflammation may spread by continuity to the ureters and the pelves of the kidneys. Küstner in a case of prolapsus uteri saw a profound purulent pyelitis which ran a fatal course.

Inflammatory changes of the internal sexual organs, the tubes and ovaries, and the pelvic peritoneum are quite frequent in prolapse. Küstner, in a series of eighty cases of laparotomies, ventrofixations, and plastic operations on the vagina for prolapse, carefully examined the internal sexual organs and found that in almost one-half of them chronic inflammatory processes could be observed in the ovaries, the pelvic peritoneum, and the fimbriated extremities of the Fallopian tubes. The pathologic conditions found were oöphoritis corticalis, hydrops folliculorum ovarii, perimetritis, perisalpingitis with or without closure

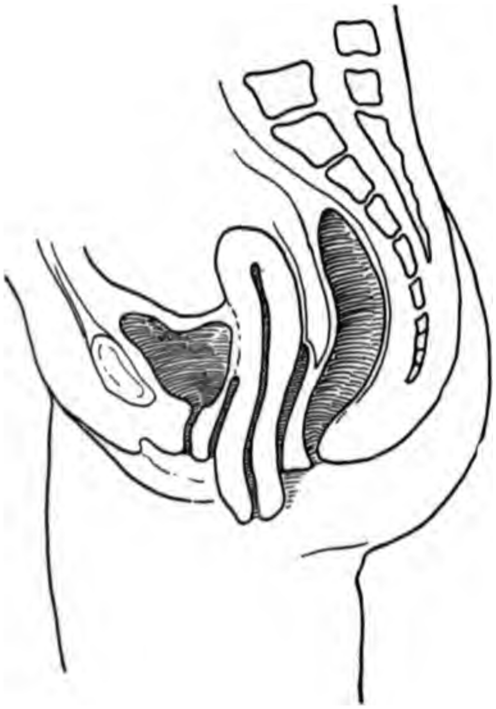


FIG. 199.—PROLAPSE OF THE UTERUS WITH ELONGATED AND HYPERTROPHIED CERVIX. (After Runge.)

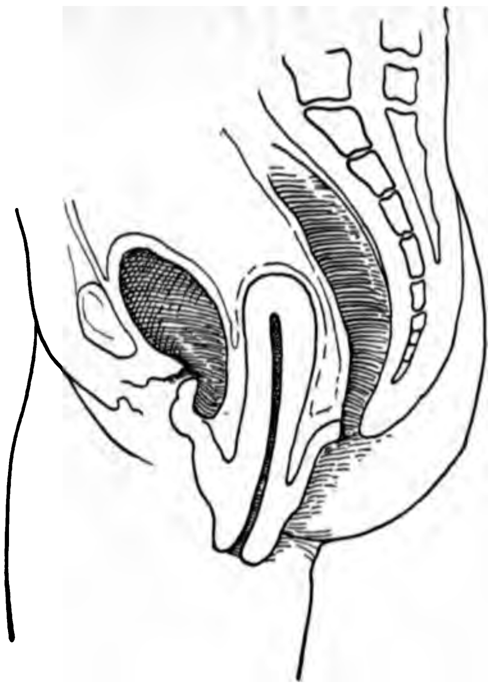


FIG. 200.—PROLAPSE OF THE UTERUS WITH ELONGATION AND HYPERTROPHY OF THE CORPUS AND WITH SOME DISPLACEMENT OF THE BLADDER. (After Runge.)

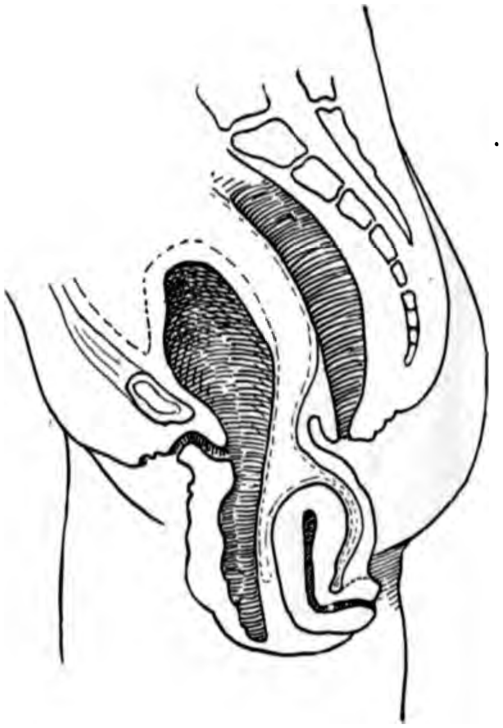


FIG. 201.—COMPLETE PROLAPSE OF RETROFLEXED UTERUS WITH MARKED PROLAPSE OF THE BLADDER. (After Runge.)

of the abdominal end of the tube, and hydrops of the tubes. The same author frequently noticed a mild degree of serous infiltration of the pelvic peritoneum. In some of his fatal cases of prolapse he saw, in consequence of profound septic infection due to streptococci, abscess formation in the subperitoneal connective tissue, particularly in the connective tissue between the bladder and uterus; also purulent infiltration of the muscular coat of the uterus, abscess of the ovary, and encapsulated or general purulent peritonitis. The various gross changes in prolapsus of the uterus are shown in the accompanying drawings from Runge (Figs. 199, 200, and 201).

SYMPTOMS AND DIAGNOSIS OF UTERINE DISPLACEMENTS

The symptoms of uterine displacements vary with the character and degree of the displacement. The question of diagnosis will, therefore, be considered with respect to each particular class of cases. (a) The symptoms and diagnosis of retrodisplacements (retroflexion and retroversion) are considered first because Winckel, Lohlein, and Sänger, in a record of several thousand patients, show that retrodeviations occur in 17.74 per cent. of all gynecologic patients. These displacements may cause no appreciable symptoms; or, on the other hand, they may create such disturbance that they may properly be classified among the most distressing and persistent maladies with which a woman can be afflicted. They give rise not only to local discomfort, but to constitutional ill health; they render a woman unfit for the marital relation, and are the cause of sterility; and their prompt detection and effective treatment are among the most imperative duties devolving upon the practitioner.

When retrodeviation occurs suddenly, as from a fall or a jump, the patient complains of pain low down in the back, sacralgia, and general pelvic discomfort. This discomfort may at times become a sharp, lancinating pain. When the displacement is of longer standing the patient complains of pain in the back and in the neighborhood of the sacrum and the coccyx, often radiating down the legs, frequently into the external pudendal organs, and often centering in the clitoris. This pain is exaggerated by walking, stair-climbing, or any laborious occupation. Dysuria is generally present, and the patient sooner or later complains of constipation. This latter condition is frequently associated with other disturbances of the digestive tract, causing impairment of the general nutrition, loss of flesh, and the general appearances of anemia. The diagnosis, however, will depend upon the physical conditions discovered by local examination. The examination should be made with the patient on her back and her head a little elevated (see Methods of Examination and Diagnosis). Digital examination, particularly in the case of retroversion, will reveal a change in the uterine axis, manifested by anterior displacement of the cervix. If the finger is now passed up toward the cul-de-sac a mass will be felt. This may be due to a loaded sigmoid, a loaded prolapsed colon, a subperitoneal myoma, an enlarged and displaced ovary, or a descended and distended Fallopian tube; or it may be the fundus of the uterus. At this point the diagnosis will be materially facilitated by placing the other hand over the abdominal wall, when, if the condition is a retrodeviation, the fundus of the uterus will not be discovered in its normal situation. If the case is one of retroflexion instead of retroversion the point of angulation can generally be detected by the intravaginal finger. In recent cases of uncomplicated retrodeviation pelvic engorgement associated with pronounced tenderness may be present and may temporarily mask the condition of the uterus. Retrodeviations frequently coexist with and are caused by myomata, and inflammations, enlargements, and displacements of the appendages. The sound was formerly employed as a means of diagnosis in these cases, but so much damage has followed its use that its employment in this connection has been abandoned by judicious practitioners. An index finger may be introduced into the rectum, whereby some additional information may be obtained. The diagnosis should, however, be made by means of the bimanual examination and without recourse to instrumental or other exploration.

The Symptoms and Diagnosis of Anterior Displacements (Anteflexion and Anteversion).—Relatively to the vertical axis of the body the uterus normally occupies a position of anteversion. This fact makes it difficult to determine when an anterior displacement exists in a pathological degree. This is particularly true of anteversion; while the detection of a point of flexure in the axis of the uterus on its anterior surface is conclusive evidence of the existence of an anteflexion. In forward displacements there is generally pain in the sacral region with more or less vesical irritation and tenesmus; dysmenorrhea and sterility are usually present. The diagnosis is generally made without difficulty by bimanual examination. The fundus occupies a position anterior to its normal plane, the cervix generally pointing backward. If, with the patient lying upon her back, the finger is passed behind the cervix and the latter is drawn upward toward the pubis, the fundus will naturally be drawn upward and backward; and if, when the force is removed from the cervix, the uterus returns to the state of extreme anteversion, it may be known not only that forward displacement exists to a pathological degree, but also that the anterior wall of the uterus is attached to the fundus of the bladder. The existence of a point of flexure on the anterior wall about the cervicocorporeal junction will establish the difference between anteversion and anteflexion. It should be remembered that a small subperitoneal fibroid on the anterior wall may feel like anteflexion, and the difference may not be detected without the use of the sound or an abdominal section. It is safer to exclude the sound as a means of diagnosis, and in the hands of a careful and competent examiner it is rarely, if ever, necessary (see Methods of Examination and Diagnosis).

The Symptoms and Diagnosis of Prolapsus of the Uterus.—Prolapsus of the uterus, like other displacements, may be so slight as to escape ready detection, or it may be so extreme as to be obvious, the uterus lying entirely outside the vulva (Fig. 188). Pain in the loins, sacralgia, increased by walking, prolonged standing, or overhead work, and particularly by straining at defecation, is the first to attract attention. This pain increases as the condition advances, until the patient becomes conscious of what she construes to be a foreign body in the vagina. Pressure by the descending organ is liable to cause vesical and rectal tenesmus. In a still later stage of development, as a result of straining at stool, or lifting, or standing, or of any laborious physical occupation, the cervix presents at the ostium vaginæ, or the entire uterus may protrude externally and occupy a position between the thighs, returning within the vagina when the straining ceases. The diagnosis in the earlier stages is not always easily made. Patients are generally examined in either the recumbent or the semi-prone (Sims) position, in either of which, but particularly in the latter, a uterus in the earlier stages of descent has a tendency to gravitate into its normal situation. It occasionally happens that the first suggestion of an existing prolapse is derived from the fact that a well-adjusted tampon is being unaccountably extruded from the vagina. This fact will prompt an examination of the patient in the standing posture—provided that this has not already been done as a part of the earlier examination of the case. The uterus will be found to have descended from its normal plane and to occupy a position of relative retroversion. It may be found in any degree of descent. Complete procidentia may be mistaken by the patient herself for cystocele and hydrocele, but this point is easily cleared up by careful examination. A uterine polypus, or even one of vaginal origin, may simulate complete procidentia uteri. The diagnosis is cleared up under these circumstances by careful digital examination, with particular reference to detecting the location and condition of the cervix. Bimanual exploration, by determining the location of the fundus and the size of the uterus, will clear up any remaining doubts. Inversion has been mistaken for prolapsus of the uterus, but the history of the case, the existence of the hemorrhage, the character of the mucosa, and the existence or non-existence of the fundus in its normal relations, as determined by bimanual examination, will lead to an accurate conclusion.

Symptoms and Diagnosis of Inversion of the Uterus.—See Inversion of Uterus in section on Pregnancy and Parturition.

Symptoms and Diagnosis of Ascent of the Uterus.—The uterus never remains above its normal plane, unless it is either forced up by some growth, such as a large fibroid or cyst, occupying the true pelvis, or by pregnancy. Occasionally it is held abnormally high by adhesions, such, for instance, as from ventrosuspension of the uterus. The condition cannot be said to have a definite symptomatology. Sometimes the patient complains of traction pains in the pelvis, especially in the neighborhoood of the ovaries. There is generally marked irritation of the bladder with frequent desire to urinate. Examination will generally reveal the meatus urinarius drawn up somewhat into the vagina. The usual vesical sponginess of the bladder is liable to be absent under the pubes. The cervix, if felt at all, is situated very high, and then the os alone can be made out. Sometimes it is entirely beyond reach. I have had several cases in which it had been carried to a level with the umbilicus.

TREATMENT OF DISPLACEMENTS OF THE UTERUS

The treatment of displacements of the uterus in general embraces the application of certain principles common to each of the forms of displacement. The object aimed at in each instance is, as far as possible, to restore the original anatomical and functional integrity of the displaced organ, as well as of the associated organs and structures that are influenced by the displacement. This procedure, to be entirely rational, must contemplate as a preliminary step the removal of the original cause, if it is still persistent, and of any other causes that may be responsible for the perpetuation of the condition. The consequences may have become so established as to demand treatment for their removal.

These general principles of treatment call for special consideration with reference to their application, and to the procedures for their application to the various special forms of displacement.

The treatment of various displacements of the uterus is divided into:

(a) Topical and manipulative.
(b) Instrumental.
(c) Operative.

Topical, manipulative, and instrumental treatment may be further classified as palliative, while operative treatment is intended to be radically curative. The first step in the judicious application of any of these means of cure must consist in determining, with at least approximate accuracy, not only the existence of the displacement, but of the various complications with which it may be associated. Thus, in the presence of a metritis, of acute inflammation of the Fallopian tubes, or of recent intense and painful general engorgement of the pelvis, all manipulations having for their object the reduction of the displacement should be interdicted. In the presence of these conditions the patient should be put in the recumbent posture and should be treated with salines, hot douches, and glycerin tamponade until the acute symptoms have subsided.

TOPICAL AND MANIPULATIVE TREATMENT OF RETRODISPLACEMENTS OF THE UTERUS

Acute exacerbations of pelvic pain, especially of sacral pain, due to pressure of the fundus of a retroflexed uterus upon the sacral plexus, makes it important that immediate relief be afforded. As a rule, this can be done upon the examination table without having the patient change from the dorsal position, by the following manipulation, viz.:

74. KÜSTNER PROCEDURE FOR THE REPOSITION OF THE RETRODISPLACED UTERUS

(1) With the patient on her back, her thighs flexed, and her feet elevated, two fingers are introduced into the vagina, and the fingers of the other hand are pressed down upon the abdominal wall over the uterus, as in the ordinary manipulation for bimanual examination (Fig. 202).

(2) The intravaginal fingers press the fundus upward in an attempt to unbutton it from between the uterosacral ligament (Fig. 203), the pressure by the abdominal hand having been relinquished.

(3) The work of elevating the fundus by the intravaginal hand is continued until the fundus can be clearly felt by the abdominal hand (Fig. 204).

(4) When the internal finger has forced the uterus upward to the point of normal anteversion the fundus is brought under control of the extraabdominal hand (Fig. 205).

75. KÜSTNER PROCEDURE FOR INSTRUMENTODIGITAL REPOSITION OF THE UTERUS

In certain cases the preceding procedure is not practicable, because the fundus of the uterus is locked between the uterosacral ligaments

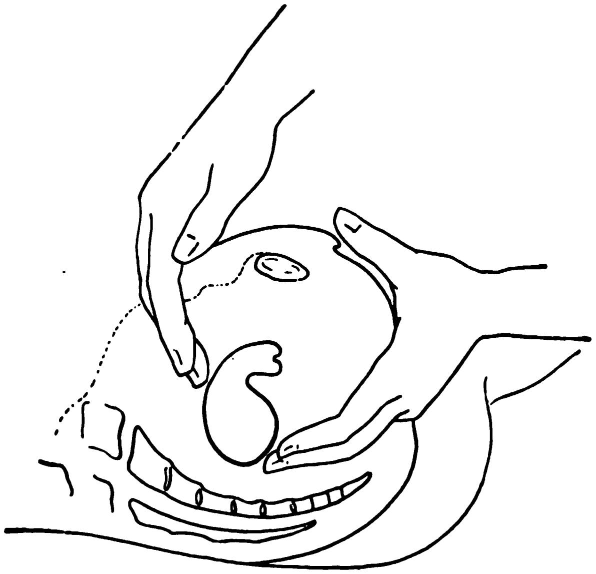


FIG. 202.—(74) KÜSTNER PROCEDURE FOR REPOSITION OF RETRODISPLACED UTERUS BY BIMANUAL MANIPULATION. (a) The uterus is brought under control of the two hands. (After Küstner.)

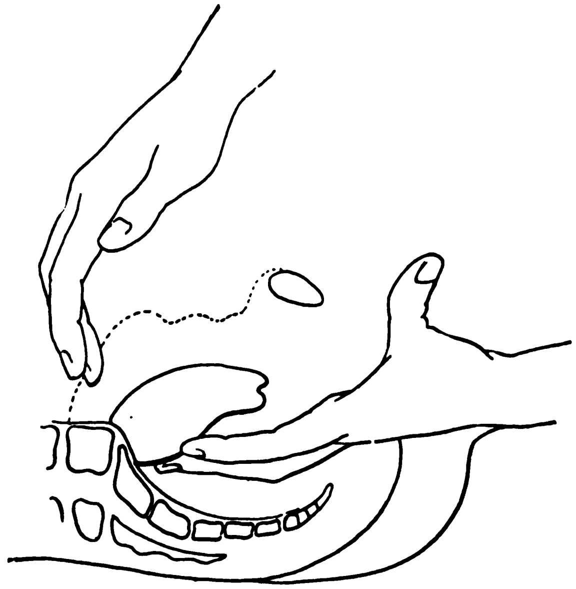


FIG. 203.—(74) KÜSTNER PROCEDURE FOR REPOSITION OF RETRODISPLACED UTERUS BY BIMANUAL MANIPULATION. (b) The fingers in the vagina are lifting the fundus upward, unbuttoning it from between the uterosacral ligaments, the pressure from the external hand having been withdrawn. (After Küstner.)

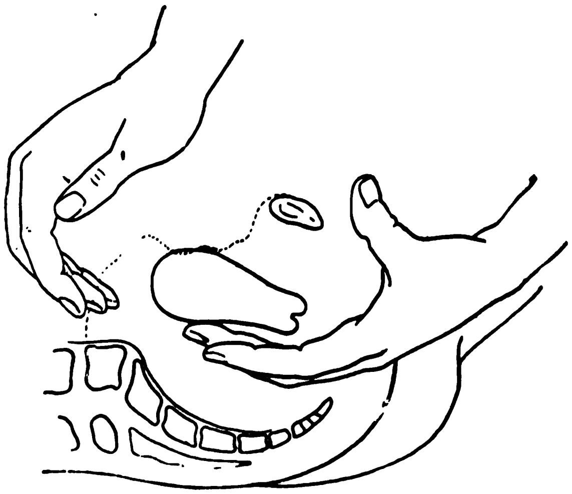


FIG. 204.—(74) KÜSTNER PROCEDURE FOR REPOSITION OF RETRODISPLACED UTERUS BY BIMANUAL MANIPULATION. (c) The elevation of the fundus is continued by the internal hand until the fundus itself can be distinctly felt by the external hand. (After Küstner.)

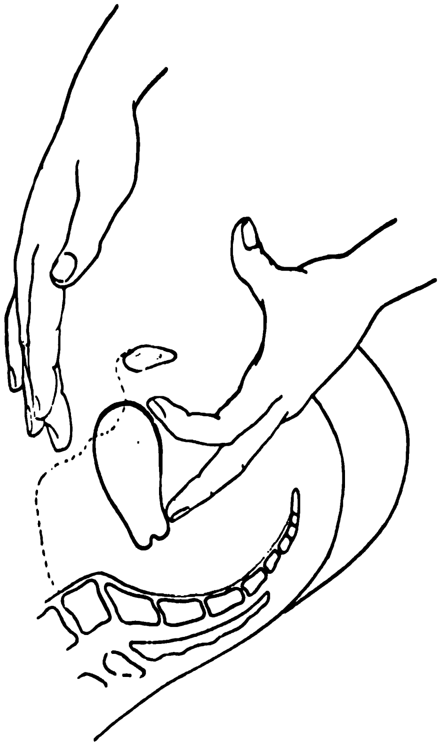


FIG. 205.—(74) KÜSTNER PROCEDURE FOR REPOSITION OF RETRODISPLACED UTERUS BY BIMANUAL MANIPULATION. (d) One finger within the vagina continues to press the cervix upward, while the external hand controls the fundus and forces the uterus into normal position. (After Küstner.)

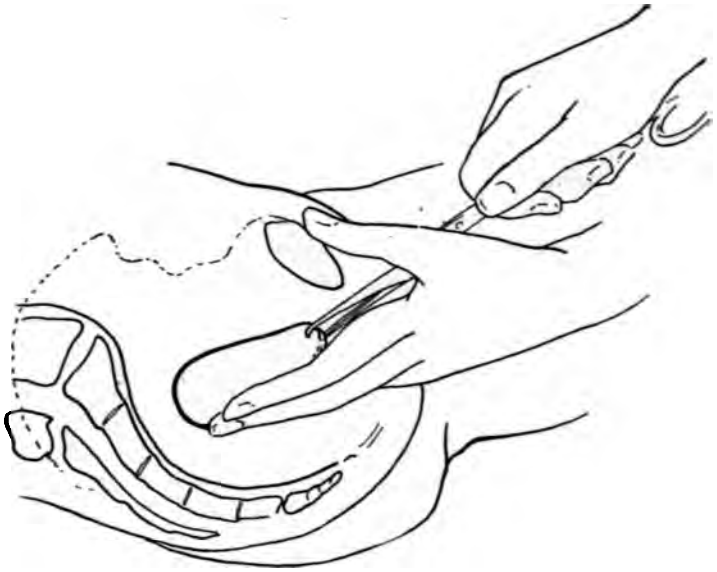


Fig. 206.—(75) Kustner Procedure for Reposition of Retrodisplaced Uterus by Combined Digital and Instrumental Method. (a) With the fingers pressed up to the cul-de-sac, the cervix is seized with volsellum forceps and gently drawn down. (After Josephson.)

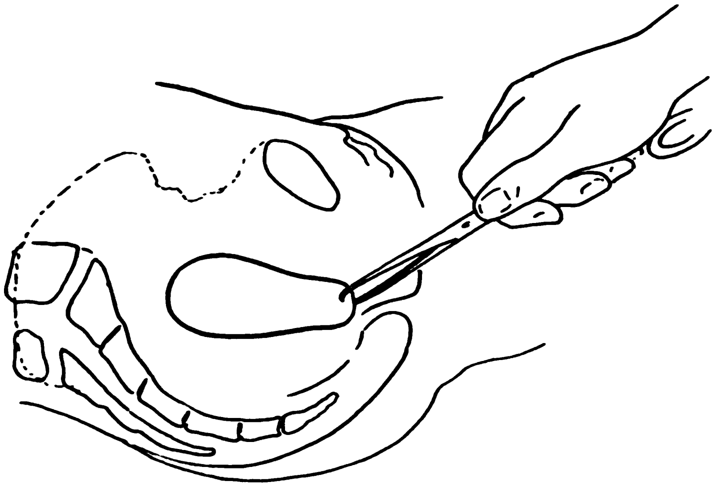


Fig. 207.—Kustner Procedure for Reposition of Retrodisplaced Uterus by Combined Digital and Instrumental Method. (b) The fundus having been pushed up from between the uterosacral ligaments, the cervix is quickly pushed upward and backward to its normal position thus throwing the fundus forward. (After Josephson.)

and cannot be dislodged by bimanual manipulation. In such cases Küstner has recourse to the following manipulation:

(1) With the patient in the dorsal position, the thighs well flexed, two fingers are introduced, palms upward, into the vagina.

(2) A volsellum is then introduced into the vagina along the palmar surface of the fingers, and made to seize the cervix by a deep lateral bite (Fig. 206).

(3) Downward traction is then made, gently but firmly, on the cervix until by the sense of touch the operator feels that the cervix is unbuttoned by the fingers from the uterosacral ligaments (Fig. 207).

(4) The volsellum forceps, still in the cervix, are utilized to push it upward and backward into the hollow of the sacrum, thus throwing the fundus forward into its normal position.

(5) The vagina is then packed with a long slender tampon (Fig. 208), or a Smith-Hodge pessary is inserted (see Figs. 211-214).

It should be distinctly understood that this is not a safe procedure, and should not be undertaken in cases in which adhesions can be demonstrated to exist, or, in fact, in cases in which there is a probability of their existence.

(6) With one finger within the vagina still pressing the cervix upward, the external hand takes charge of the fundus, pressing it toward the pubes and thus causing the uterus to assume the position of normal anteversion (Fig. 205).

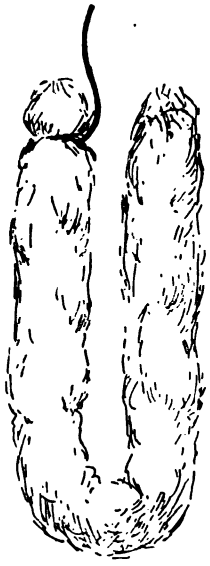


FIG. 208.—A LONG SLENDER TAMPON WITH THE FIBER RUNNING LENGTHWISE.

POSTURE, MASSAGE, AND TAMPONADE IN THE TREATMENT OF RETRODEVIATIONS OF THE UTERUS

After the uterus has been replaced by a digital manipulation it should be held in position by some mechanical support, or it will soon return to its displaced position. This indication is met by the introduction of a tampon into the upper zone of the vagina. Fine lamb's wool is the better material. If cotton is used that from which the oil has not been expressed is better than absorbent cotton, which speedily packs. If carefully applied it will furnish to the replaced uterus an important support, while if saturated with glycerin the exosmotic property of the latter will exercise a valuable influence in effecting the absorption of inflammatory exudates. A tampon, however, which amounts to nothing more or less than a large plug in the vagina (Fig. 210), and which is large enough to distend the vulvar orifice when it is removed, and requires considerable traction to remove it, is always a source of damage. The repeated downward traction thus exercised upon the vaginal wall has a tendency to drag the uterus downward in the pelvis and thus to aggravate the very condition that it is designed to remedy. A tampon properly adjusted should occupy the upper portion of the vagina, should not exercise enough pressure to occasion discomfort, and should be so constructed that its removal will not involve traction upon the pelvic viscera. The well-known chain tampon (Fig. 209) is very good; but a better one consists of a long narrow roll of either lamb's wool or cotton, with the fiber running lengthwise, and with a string attached at one end (Fig. 208). The ends of the string are left about 6 inches long. A strand of silk-worm gut used for this purpose is very desirable, because of its lack of porosity. The tampon, 10 or 12 inches long or even longer, is now passed into the vagina through a speculum, care being taken that it does not extend far enough down in the canal to occasion tenesmus. When such a tampon is removed but little effort is required, and the patient makes no complaint of the dragging and pulling that is the unpleasant feature in the removal of one that is improperly constructed. In adjusting a tampon care should be exercised to pack the upper part of the canal by so placing the tampon that it will tend mechanically to hold the replaced uterus in position. Thus, in the instance of retrodisplacements, the cervix should be pushed into the posterior vault of the vagina, with the tampon packed in front of it.

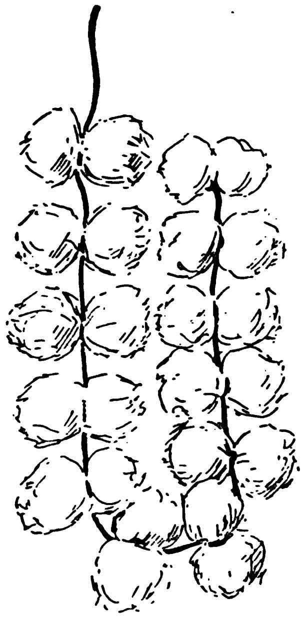


FIG. 209.—A CHAIN TAMPON.

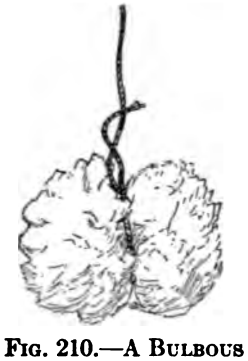


FIG. 210.—A BULBOUS TAMPON THAT GENERALLY DOES DAMAGE BY TRACTION ON REMOVAL.

The knee-chest position, associated with perineal retraction and atmospheric pressure, may be advantageously employed in the systematic treatment of these cases, as follows:

wall of the uterus is attached to the fundus of the bladder. The existence of a point of flexure on the anterior wall about the cervico-corporeal junction will establish the difference between anteversion and anteflexion. It should be remembered that a small subperitoneal fibroid on the anterior wall may feel like anteflexion, and the difference may not be detected without the use of the sound or an abdominal section. It is safer to exclude the sound as a means of diagnosis, and in the hands of a careful and competent examiner it is rarely, if ever, necessary (see Methods of Examination and Diagnosis).

The Symptoms and Diagnosis of Prolapsus of the Uterus.—Prolapsus of the uterus, like other displacements, may be so slight as to escape ready detection, or it may be so extreme as to be obvious, the uterus lying entirely outside the vulva (Fig. 188). Pain in the loins, sacralgia, increased by walking, prolonged standing, or overhead work, and particularly by straining at defecation, is the first to attract attention. This pain increases as the condition advances, until the patient becomes conscious of what she construes to be a foreign body in the vagina. Pressure by the descending organ is liable to cause vesical and rectal tenesmus. In a still later stage of development, as a result of straining at stool, or lifting, or standing, or of any laborious physical occupation, the cervix presents at the ostium vaginæ, or the entire uterus may protrude externally and occupy a position between the thighs, returning within the vagina when the straining ceases. The diagnosis in the earlier stages is not always easily made. Patients are generally examined in either the recumbent or the semi-prone (Sims) position, in either of which, but particularly in the latter, a uterus in the earlier stages of descent has a tendency to gravitate into its normal situation. It occasionally happens that the first suggestion of an existing prolapse is derived from the fact that a well-adjusted tampon is being unaccountably extruded from the vagina. This fact will prompt an examination of the patient in the standing posture—provided that this has not already been done as a part of the earlier examination of the case. The uterus will be found to have descended from its normal plane and to occupy a position of relative retroversion. It may be found in any degree of descent. Complete procidentia may be mistaken by the patient herself for cystocele and hydrocele, but this point is easily cleared up by careful examination. A uterine polypus, or even one of vaginal origin, may simulate complete procidentia uteri. The diagnosis is cleared up under these circumstances by careful digital examination, with particular reference to detecting the location and condition of the cervix. Bimanual exploration, by determining the location of the fundus and the size of the uterus, will clear up any remaining doubts. Inversion has been mistaken for prolapsus of the uterus, but the history of the case, the existence of the hemorrhage, the character of the mucosa, and the existence or non-existence of the fundus in its normal relations, as determined by bimanual examination, will lead to an accurate conclusion.

Symptoms and Diagnosis of Inversion of the Uterus.—See Inversion of Uterus in section on Pregnancy and Parturition.

Symptoms and Diagnosis of Ascent of the Uterus.—The uterus never remains above its normal plane, unless it is either forced up by some growth, such as a large fibroid or cyst, occupying the true pelvis, or by pregnancy. Occasionally it is held abnormally high by adhesions, such, for instance, as from ventrosuspension of the uterus. The condition cannot be said to have a definite symptomatology. Sometimes the patient complains of traction pains in the pelvis, especially in the neighborhoood of the ovaries. There is generally marked irritation of the bladder with frequent desire to urinate. Examination will generally reveal the meatus urinarius drawn up somewhat into the vagina. The usual vesical sponginess of the bladder is liable to be absent under the pubes. The cervix, if felt at all, is situated very high, and then the os alone can be made out. Sometimes it is entirely beyond reach. I have had several cases in which it had been carried to a level with the umbilicus.

TREATMENT OF DISPLACEMENTS OF THE UTERUS

The treatment of displacements of the uterus in general embraces the application of certain principles common to each of the forms of displacement. The object aimed at in each instance is, as far as possible, to restore the original anatomical and functional integrity of the displaced organ, as well as of the associated organs and structures that are influenced by the displacement. This procedure, to be entirely rational, must contemplate as a preliminary step the removal of the original cause, if it is still persistent, and of any other causes that may be responsible for the perpetuation of the condition. The consequences may have become so established as to demand treatment for their removal.

These general principles of treatment call for special consideration with reference to their application, and to the procedures for their application to the various special forms of displacement.

The treatment of various displacements of the uterus is divided into:

(a) Topical and manipulative.
(b) Instrumental.
(c) Operative.

Topical, manipulative, and instrumental treatment may be further classified as palliative, while operative treatment is intended to be radically curative. The first step in the judicious application of any of these means of cure must consist in determining, with at least approximate accuracy, not only the existence of the displacement, but of the various complications with which it may be associated. Thus, in the presence of a metritis, of acute inflammation of the Fallopian tubes, or of recent intense and painful general engorgement of the pelvis, all manipulations having for their object the reduction of the displacement should be interdicted. In the presence of these conditions the patient should be put in the recumbent posture and should be treated with salines, hot douches, and glycerin tamponade until the acute symptoms have subsided.

TOPICAL AND MANIPULATIVE TREATMENT OF RETRODISPLACEMENTS OF THE UTERUS

Acute exacerbations of pelvic pain, especially of sacral pain, due to pressure of the fundus of a retroflexed uterus upon the sacral plexus, makes it important that immediate relief be afforded. As a rule, this can be done upon the examination table without having the patient change from the dorsal position, by the following manipulation, viz.:

74. KÜSTNER PROCEDURE FOR THE REPOSITION OF THE RETRODISPLACED UTERUS

(1) With the patient on her back, her thighs flexed, and her feet elevated, two fingers are introduced into the vagina, and the fingers of the other hand are pressed down upon the abdominal wall over the uterus, as in the ordinary manipulation for bimanual examination (Fig. 202).

(2) The intravaginal fingers press the fundus upward in an attempt to unbutton it from between the uterosacral ligament (Fig. 203), the pressure by the abdominal hand having been relinquished.

(3) The work of elevating the fundus by the intravaginal hand is continued until the fundus can be clearly felt by the abdominal hand (Fig. 204).

(4) When the internal finger has forced the uterus upward to the point of normal anteversion the fundus is brought under control of the extraabdominal hand (Fig. 205).

75. KÜSTNER PROCEDURE FOR INSTRUMENTODIGITAL REPOSITION OF THE UTERUS

In certain cases the preceding procedure is not practicable, because the fundus of the uterus is locked between the uterosacral ligaments

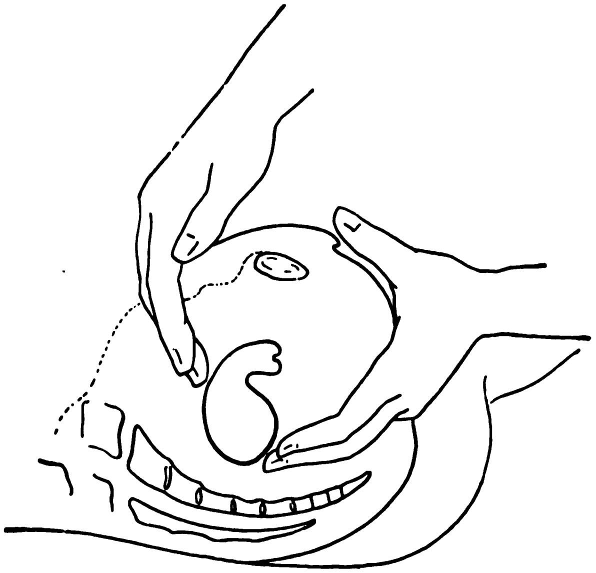


Fig. 202.—(74) Küstner Procedure for Reposition of Retrodisplaced Uterus by Bimanual Manipulation. (a) The uterus is brought under control of the two hands. (After Küstner.)

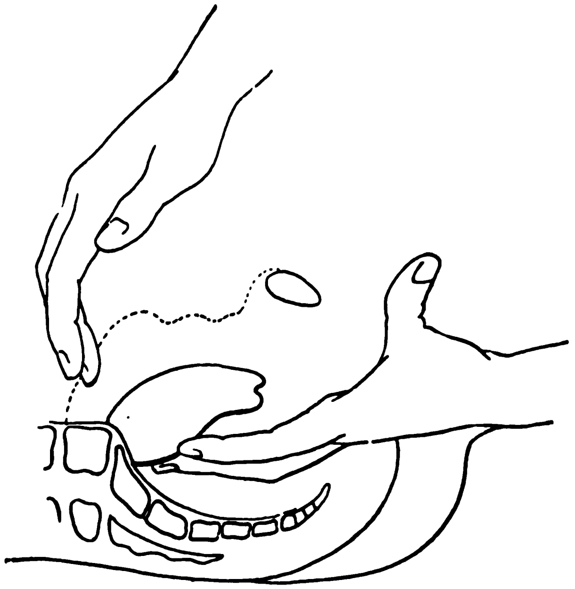


Fig. 203.—(74) Küstner Procedure for Reposition of Retrodisplaced Uterus by Bimanual Manipulation. (b) The fingers in the vagina are lifting the fundus upward, unbuttoning it from between the uterosacral ligaments, the pressure from the external hand having been withdrawn. (After Küstner.)

(5) Returning the adnexa to their positions, the two fingers now explore the fundus and break up adhesions, if they exist, by cautious tearing or, if they are firm, by cutting.

(6) When entirely free the fundus is brought up by the fingers into the abdominal incision. When the abdominal walls are thick this may be done to advantage by seizing each round ligament with forceps.

(7) The parietal peritoneum is everted in one side, a stitch is inserted into it 1 to 1.5 cm. from the edge of the wound, and emerges 8 to 10 mm. from its insertion.

(8) The same stitch is carried by a needle transversely through the posterior wall 1 to 2 cm. below the level of the tubal attachments and to a depth of from 3 to 4 mm. in the uterine tissue (Fig. 215).

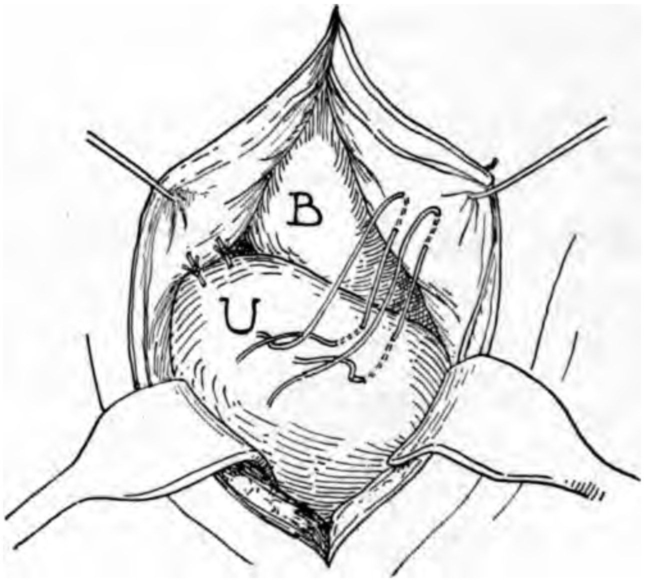


FIG. 215.—(78) KELLY PROCEDURE FOR VENTRAL SUSPENSION OF THE UTERUS. (a) (After MacMonagle.)

(9) The peritoneum in the other side of the incision is similarly treated. A third stitch is sometimes necessary if the uterus is hypertrophied or heavy, or if it drags heavily on the stitches.

(10) The stitches are now tied and the abdominal incision is closed.

This operation was first conceived as one of "fixation," by which the fundus was firmly implanted into the anterior abdominal wall. The results, while sometimes satisfactory, were too often followed by persistent traction pains, by irritability and restricted expansibility of

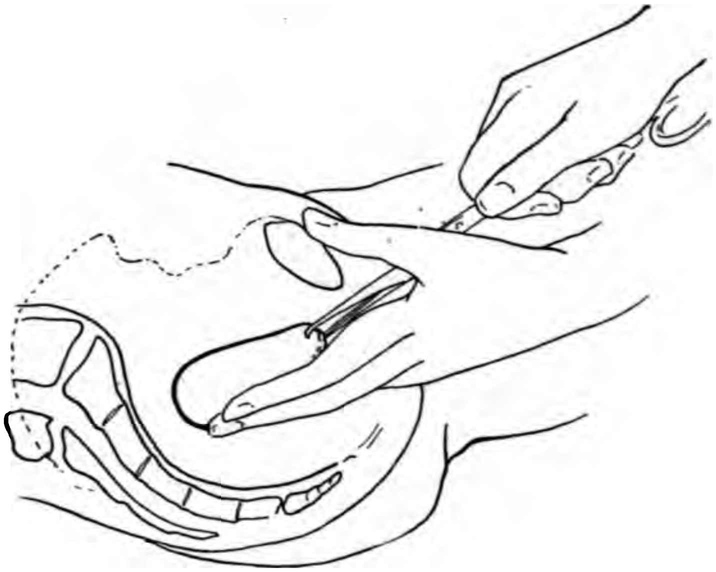


Fig. 206.—(75) Kustner Procedure for Reposition of Retrodisplaced Uterus by Combined Digital and Instrumental Method. (a) With the fingers pressed up to the cul-de-sac, the cervix is seized with volsellum forceps and gently drawn down. (After Josephson.)

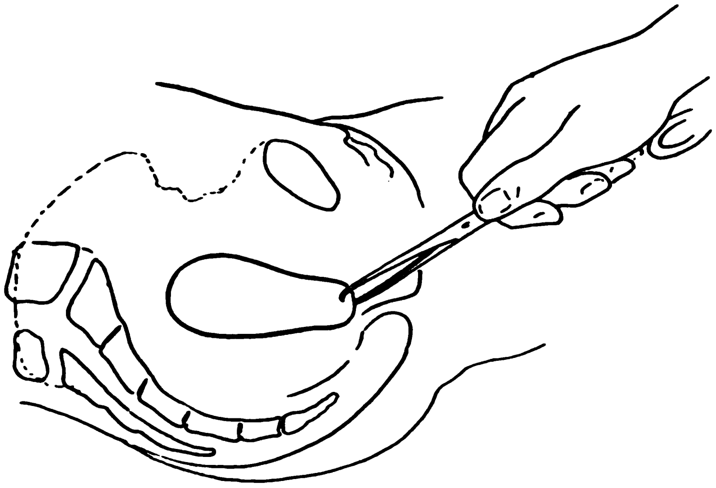


Fig. 207.—Kustner Procedure for Reposition of Retrodisplaced Uterus by Combined Digital and Instrumental Method. (b) The fundus having been pushed up from between the uterosacral ligaments, the cervix is quickly pushed upward and backward to its normal position thus throwing the fundus forward. (After Josephson.)

effecting the permanent reposition of the retrodisplaced uterus. Operations for this purpose are susceptible of classification as external and internal, or as operations within the abdominal wall and within the abdominal cavity.

79. ALQUIE-ALEXANDER PROCEDURE FOR SHORTENING THE ROUND LIGAMENTS

The idea of shortening the round ligaments for the cure of backward displacements of the uterus was first suggested by Alquié, of France, in 1840. This suggestion was not favorably received, and it was not until Alexander, of Liverpool, successfully performed the operation and carefully described the procedure that it was accepted. Adams performed the operation independently a few months later, but it was undoubtedly Alexander's monograph, published in 1884, which induced other operators to follow his example, and placed the operation on a firm basis.

The procedure, as described by Mann, embraces the following steps, viz.:

(1) Either the spine of the pubis or the external abdominal ring is felt for. One of both can usually be readily distinguished. An incision is then made directly over the ring, a short distance above Poupart's ligament and parallel to it. The length of the incision will vary with the amount of adipose tissue present. In many thin persons the incision may be less than an inch in length; two inches is the maximum length in any case.

(2) The fat and superficial fascia should be carefully incised until the tendon of the external oblique muscle is clearly and distinctly visible. This may be recognized by its white and glistening appearance. Between the fibers of this tendon may be seen the covering of the inguinal canal, which is recognized as a somewhat darker line, slightly triangular in shape. The finger tip readily recognizes the external ring.

(3) With the scissors the intercolumnar fascia and the external ring are snipped, and immediately a small mass of fat will extrude itself. This may be picked up between the thumb and finger and slowly and carefully raised; or, should the operator prefer, a strabismus hook may be introduced and the tissues within the canal brought forward. These tissues always contain the cord spread out in fan-shape.

(4) By raising them carefully the whitish fibers of the cord may be recognized. It should then be separated from the surrounding connective tissue and also from the nerve. The nerve should not be cut, but carefully laid aside.

(5) Then, with the fingers alone, without the use of any instrument, the cord should be slowly and carefully pulled out. In the majority of instances it comes out readily, increasing in size as the lower portions are brought up, until a large, white, fibrinous structure is brought well in view. In some instances the pubic portion of the cord is exceedingly small and requires the most careful handling; but, if great care and delicacy are used, it may be slowly and gradually brought out until the large and well-developed cord is finally secured.

(6) If the cord comes with great difficulty the intercolumnar fascia may be incised and the whole length of the canal laid open, thus exposing the cord at a point where it is usually larger and stronger.

(7) Having been once brought out, the cord is allowed to fall back into its place, the pubic end being still connected.

The length to which the cord should be pulled out varies. In simple retroversions a moderate amount of shortening is all that is needed. Should the parts be very much relaxed and the uterus enlarged and prolapsed, a greater amount of shortening will be required. No positive rule can be given for this; the judgment of the operator must decide in each case.

(8) Both cords being loosened, and all hemorrhage stopped, they are drawn out and held by an assistant well up to the abdominal wall.

(9) A stitch of catgut is passed through one pillar of the ring and then through the cord and the opposite pillar. The same stitch is then passed through these tissues in reverse order, the two ends being brought out on the same side. This mattress suture serves to keep the cord in place and effectually to close the canal.

(10) The cord is then cut off half an inch beyond the last stitch.

(11) Should the inguinal canal be still open to any extent this should be closed by additional catgut stitches.

(12) The same procedure is repeated on the other side.

Certain complications are occasionally encountered in this operation. Mann emphasizes the fact that adhesions in the inguinal canal sometimes prevent the drawing out of the cord. Sometimes the cord will break, and still more rarely, after breaking the cord, the uterine end cannot be recovered through the incision. Adhesions of the uterus not previously suspected cannot be determined or brought under control by the original procedure as here described. This was the beginning point for the further evolution of the procedure as subsequently to be described.

The operator is sometimes embarrassed by anatomical abnormalities. In a few instances the cord has been found not to run through the inguinal canal. Doubt may be thrown upon some of these cases, as only the most careful dissection post mortem would be sufficient to prove that the cord is not there. Failure to find the cord will be less frequent as the operator becomes more experienced. By keeping the anatomic landmarks carefully in view, and by making sure that the tendons of the external oblique muscle with the external ring are clearly exposed, and that the incision is made between the pillars of the ring and not to one side, very few failures will be encountered. In about one per cent. of cases the canal of Nuck will be found open from the internal ring to the symphysis. In these cases the round ligament is always found imbedded in the walls of the canal and cannot be separated, and the shortening of the ligaments is impossible. The fact that there is a persistent canal of Nuck on one side does not prove that the same condition exists upon the opposite side. Inguinal hernia in the female is comparatively rare, but when found often coexists with retroversion. In these cases the shortening of the round ligaments and the cure of the hernia can be done together. The round ligament will usually be found upon the hernial sac, and must be carefully searched for before the sac is cut off.

After-treatment.—The patient should be kept in bed for eight or ten days, and the wound left untouched, unless the temperature goes up. At the end of that time the dressings may be removed, when the wound should be found perfectly healed. Upon the tenth day the patient may be allowed to sit up, and may leave her room as soon after as her strength will permit. The pessary which was introduced at the time of the operation should be worn for two or three months; and, if there is much relaxation of the uterosacral ligaments, it may be necessary to keep it in for a longer period.

Modification of the Alquié-Alexander Procedure.—The complications and anatomical peculiarities mentioned in the last paragraph speedily lead to important modifications of the Alquié-Alexander operation. Goldsphon found it necessary to enlarge the external ring, first to find the retracted end of a broken ligament, then to break up adhesions. The stump of the ligament gave way in some cases, prompting operators to abandon its excision, but to use the entire pulled-out portion of the ligament for fixation. Then it was thought that other sites afforded firmer fixation. In this way it has come about that the ring is now freely opened, and, as in the Bacini and Halstead operations on the male for inguinal hernia, the cord is brought out, transplanted, and stitched to the fascia on the outside.

80. FERGUSSON PROCEDURE FOR SHORTENING THE ROUND LIGAMENTS

This method was designated by its author as one for transplanting the round ligaments and attaching them to the abdominal wall.

(1) After the usual preliminary antiseptic precautions the skin of the abdomen is opened in the median line, the incision being three inches in length and beginning an inch and a half above the symphysis.

(2) The linea alba and the anterior sheath of the recti muscles are exposed, and an incision is made on either side through the anterior sheath of the rectus.

(3) The rectus muscle is retracted outward, and an incision is made directly behind it into the peritoneal cavity through the transversalis fascia and the peritoneum.

(4) Next the round ligament and the portion of the broad ligament are seized by forceps one inch from the origin of the former, at the internal ring.

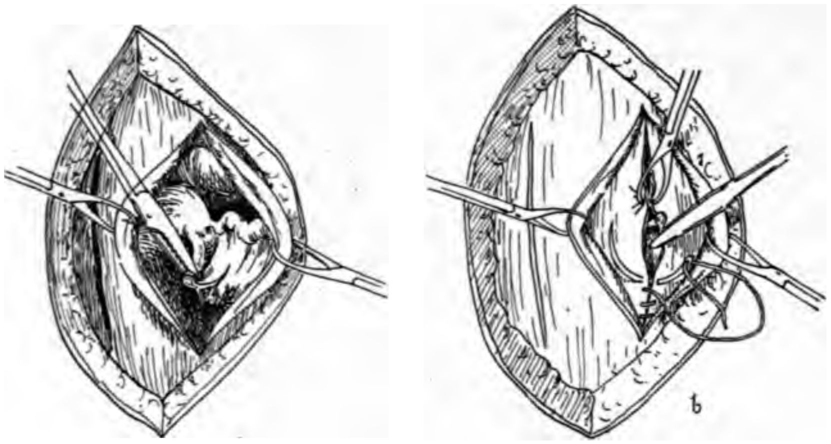


Fig. 217. Fig. 218.

Figs. 217 and 218.—(80) Fergusson Procedure for Shortening the Round Ligaments.

Fig. 217.—(a) The round ligament and part of the broad ligament have been seized by forceps and cut off.

Fig. 218.—(b) The uterine ends of the ligaments have been stitched to the parietal peritoneum and fascia in the wound.

(5) These structures are then tied externally to the forceps and divided (Fig. 217).

(6) The parietal end of the round ligament is dropped into the peritoneal cavity, and the uterine end is also pulled well out of the wound into it.

(7) The round ligament and its accompanying portion of the broad ligament are next sewed with catgut to the margins of the wound in the transversalis fascia and peritoneum (Fig. 218).

(8) The fibers of the rectus muscle are then replaced, and the

opening in the anterior sheath closed with continuous catgut suture, which grasps the end of the round ligament.

(9) A similar operation is carried out upon the other side of the median line, and the incision closed.

This procedure had the advantage of placing conditions within the pelvis under the control of the operator, and of enabling him to determine just what degree of traction he was establishing in holding the uterus in the desired position.

81. GILLIAM PROCEDURE (MODIFIED FERGUSSON OPERATION) FOR VENTRAL SUSPENSION OF THE UTERUS BY THE ROUND LIGAMENTS

This procedure is described by its author as follows, viz.:

(1) An abdominal incision three or four inches in length is made in the median line at the usual site between the umbilicus and the pubes.

(2) The adhesions are broken up and the fundus brought forward.

(3) By lifting up the broad ligament of one side on the tip of a finger applied to the posterior surface, the round ligament is brought into view and picked up with a bullet forceps.

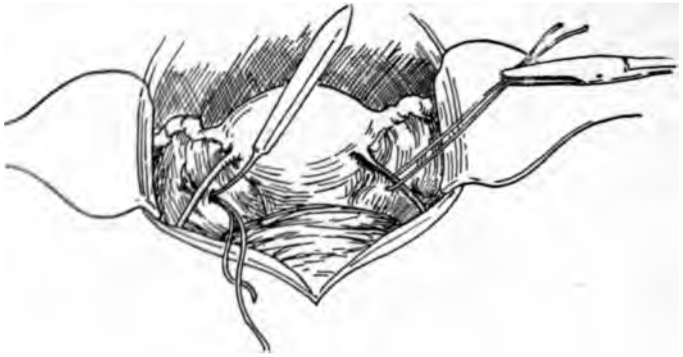


FIG. 219.—(81) GILLIAM PROCEDURE FOR VENTRAL SUSPENSION OF THE UTERUS BY THE ROUND LIGAMENTS. (a) The temporary traction sutures are placed around the round ligaments. (After Gilliam.)

(4) Selecting a point an inch and a half (4 cm.) from the uterus a thread is passed under the round ligament and the ends of the thread are brought out of the opening and secured in the bite of a clamp forceps, which is laid on the surface of the abdomen (Fig. 219).

(5) The other ligament is sought for and secured in the same manner.

(6) At a point about one inch and a half above the pubes the peri-

toneum, muscle, and fascia are caught up by a volsella and pinned together, being careful that the edges of these layers are in line.

(7) Traction is now made, and, with a claw retractor, the skin and superficial fat are drawn in the opposite direction by the volsella, and by a sweep of the knife the face of the fascia is laid bare (Fig. 220).

(8) With a narrow-bladed knife, or, better, with a Cleveland ligature carrier or some similar instrument, a stab wound is made from the surface of the fascia into the peritoneal cavity, one inch from the edge of the abdominal incision.

(9) The thread which loops the round ligament is now placed in the jaws of the ligature carrier, the clamp forceps removed, and the ligature carrier withdrawn, bringing with it the thread and the ligament (Fig. 220).

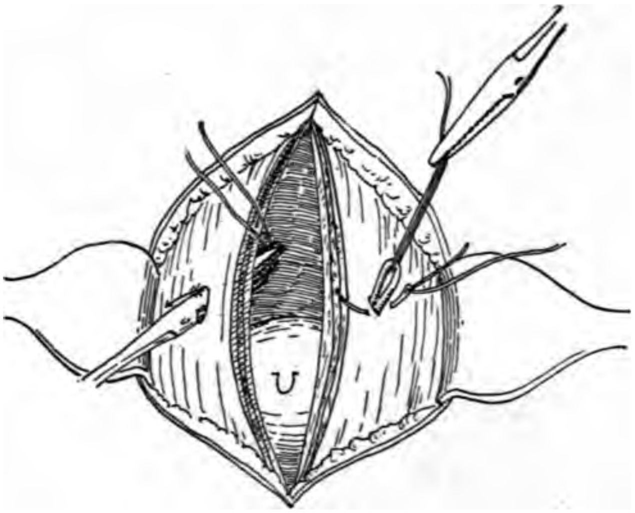


FIG. 220.—(81) GILLIAM PROCEDURE FOR VENTRAL SUSPENSION OF THE UTERUS BY THE ROUND LIGAMENTS. (b) One of the temporary traction sutures has been drawn through the peritoneum muscle and fascia and is being sutured. On the other side, a sharp-pointed forceps is beginning to draw the temporary suture through. (After Gilliam.)

(10) While the ligament is held taut, with its loop end just above the surface of the fascia, a catgut suture is passed through it, including the tissues on either side and back again, where it is tied. This is cut close to the knot, the suspending thread cut close to the ligament and withdrawn, and the volsella and retractor removed (Fig. 220).

(11) The other side is dealt with in like manner, and the abdominal incision is closed.

Some operators do not dissect the fascia from the fat, nor do they use any special instrument or any traction suture to draw out the round ligament, but simply thrust an ordinary long, curved hemostat through the fascia, muscle, and peritoneum, pick up the round ligament about at its middle. draw it through, and suture it fast.

Gilliam, in concluding his description of his procedure, calls attention to the fact that at the conclusion of the operation there is an interval between the fundus of the uterus and the abdominal wall of from 7 to 9 inches (12 to 16 cm.) in circumference, and that the two lateral openings under the broad ligaments will readily admit two and sometimes three fingers, and that the ligaments are soft, yielding, and distensible—conditions under which strangulation of the bowel would hardly be conceivable. The uterus can conform to all physiological movements, including those of pregnancy and parturition.

82. BARRETT PROCEDURE FOR SHORTENING THE ROUND LIGAMENTS

(1) The operation is done as Gilliam describes, except that

(2) With a large cutting needle the loop of the round ligament

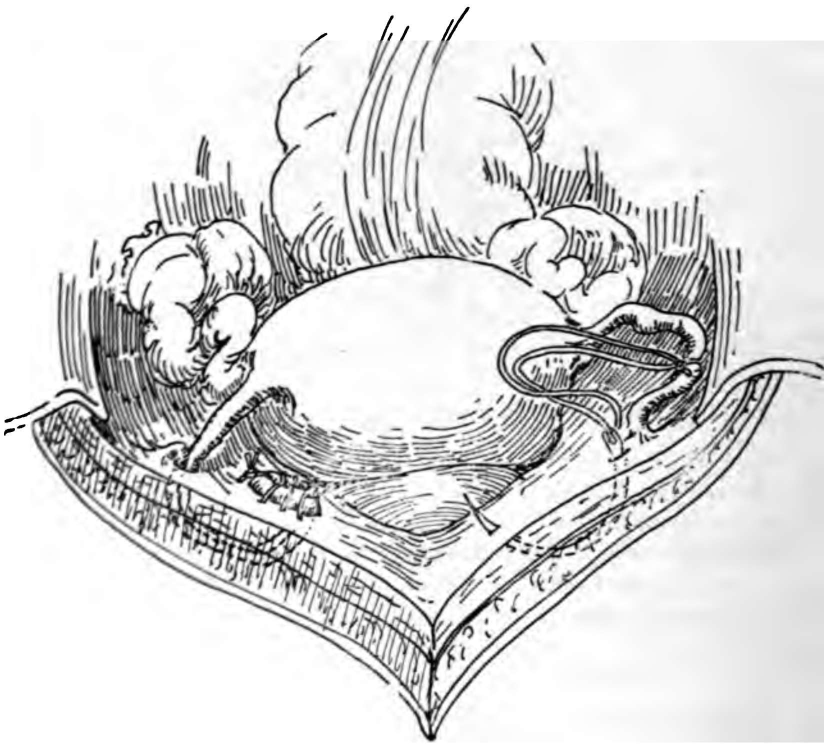


Fig. 221.—(82) Barrett Procedure (Modification of Gilliam). The round ligament loop is carried out and in through the peritoneum muscle and fascia and secured by suture.

is drawn out through the peritoneum, muscle, and fascia and back through fascia, muscle, and peritoneum into the peritoneal cavity (Fig. 221).

(3) The loop is then secured on the peritoneal surface by sutures.

83. MANN PROCEDURE FOR INTRAABDOMINAL SHORTENING OF THE ROUND LIGAMENTS

(1) Adhesions are broken up and the abdomen opened.

(2) The patient is then placed in the Trendelenburg position and the abdominal retractors put in place.

(3) A large flat sponge is spread over the intestines, and the uterus is seized by a small volsella forceps and pulled up to the abdominal wound.

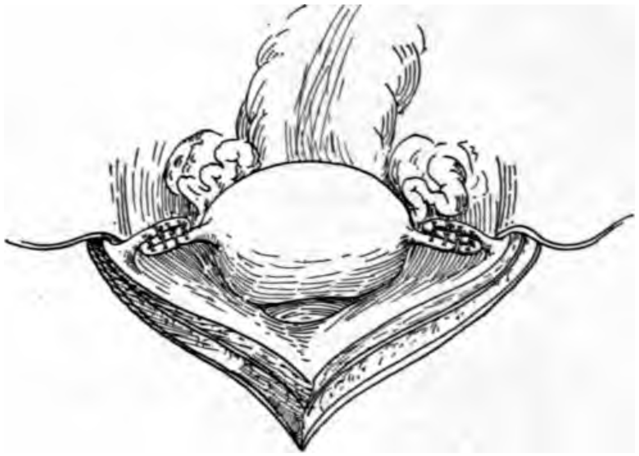


FIG. 222.—(83) MANN PROCEDURE FOR SHORTENING THE ROUND LIGAMENTS. (a) The round ligaments are folded in triplicate upon themselves and sutured with non-absorbable material.

(4) The round ligament on one side is made tense by pulling the uterus to the opposite side, and is then seized by two hemostatic forceps, the points of seizure dividing the ligament as nearly as possible into three equal portions.

(5) Next a needle threaded with silk is passed through the angle in the round ligament made by pulling upon the hemostat. This passes, therefore, twice through the ligament at points quite near to each other.

(6) It is then passed through the wall of the uterus at the point where the round ligament is inserted into the anterior uterine wall. It is well that a considerable quantity of uterine tissue be included in this suture. The usual method of passing the sutures through the anterior wall of the uterus is wrong.

(7) The hemostat being removed, the loop of the ligament is tied to the uterus.

(8) A second stitch is passed through the ligament just as it leaves the abdominal wall, and then through the second angle in the round ligament at the site of the other forceps.

(9) This ligature is tied and cut as before. In this way the ligament is doubled on itself, and three thicknesses of round ligament are stretched between the sides of the pelvis and the wall of the uterus (Fig. 222).

(10) The same thing being done upon the opposite side, the wound is closed in the usual manner.

I have used a forceps consisting of four flat tines, by which the round ligament is seized, turned half upon itself and sutured between the tines (Fig. 223).

Mann states that special indications for this operation are a backward displacement and such complications with other diseased conditions as to make the opening of the abdomen advisable. It can be done, therefore, where it is necessary to open the abdomen for reparative work on diseased tubes and ovaries, for the breaking up of adhesions, the removal of one tube and ovary, or the removal of ovarian cyst or pedunculated fibroid. It may also be done when Alexander's operation has been tried and has failed, or is contraindicated for any reason. In any abdominal section for pelvic disease, if the uterus is displaced backward, this or some operation having a similar purpose should be done. Where both tubes and ovaries are removed, or when pregnancy can not possibly occur, some might prefer

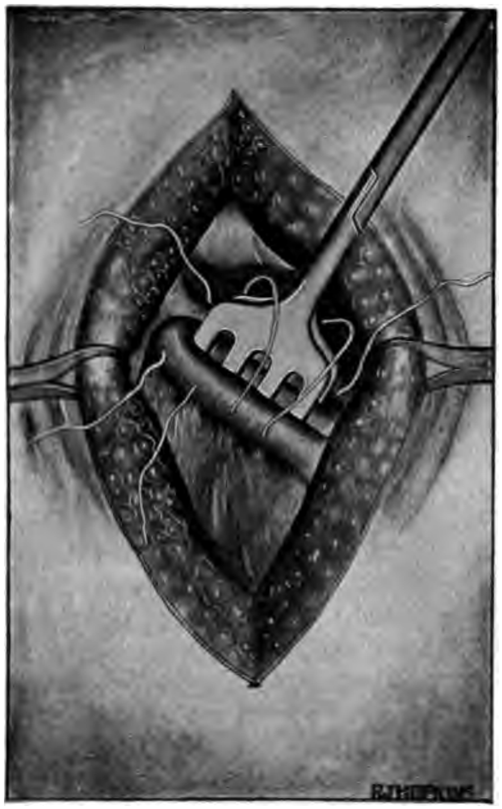


FIG. 223.—A FORCEPS WITH FOUR APPROXIMATING FLAT PRONGS, A HALF TURN OF WHICH SHORTENS THE ROUND LIGAMENT ABOUT TWO INCHES.

ventral fixation. This operation does not compete with Alexander's operation, as it fulfills entirely different indications.

84. BALDY PROCEDURE FOR SHORTENING THE ROUND LIGAMENTS IN RETRODISPLACEMENT OF THE UTERUS

The essential features of this procedure are as follows, viz.:

(1) A median abdominal incision is made and the fundus is brought forward.

(2) A hemostatic forceps is thrust from back to front through both leaflets of the broad ligament, a little below the ovarian artery.

(3) The round ligament is seized at about its middle and drawn in a loop backward through the opening in the broad ligament.

(4) The same thing is done on the other side (Fig. 224).

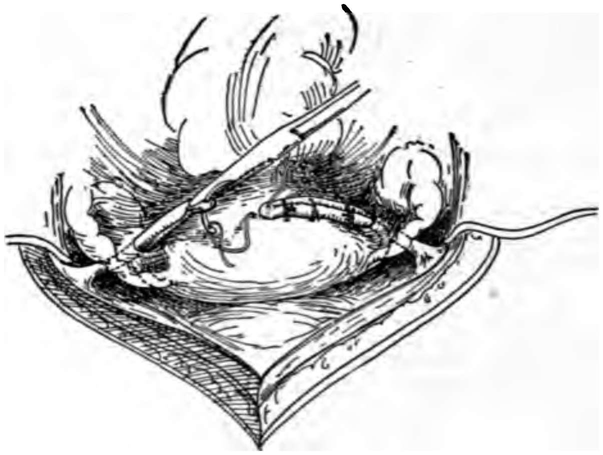


FIG. 224.—(84) BALDY PROCEDURE FOR SHORTENING THE ROUND LIGAMENTS. The round ligament on one side has been drawn through an opening in the broad ligament and sutured to the posterior uterine wall. The same thing is being done on the other side. (After Baldy.)

(5) Each loop of round ligament is then sutured to the posterior surface of the uterus (Fig. 224).

Baldy has had occasion to demonstrate the permanency of this fixation of the round ligaments several years after the operation.

85. COFFEY PROCEDURE FOR COMBINED SHORTENING OF THE ROUND AND BROAD LIGAMENTS

Coffey describes his operation as follows, viz.:

(1) Before beginning the operation proper break up adhesions and treat adnexæ, lifting the uterus and packing a sponge back of it.

(2) Then seize the round ligament about an inch and a half from the uterus, and with a No. 2 or No. 3 chromicized catgut suture stitch

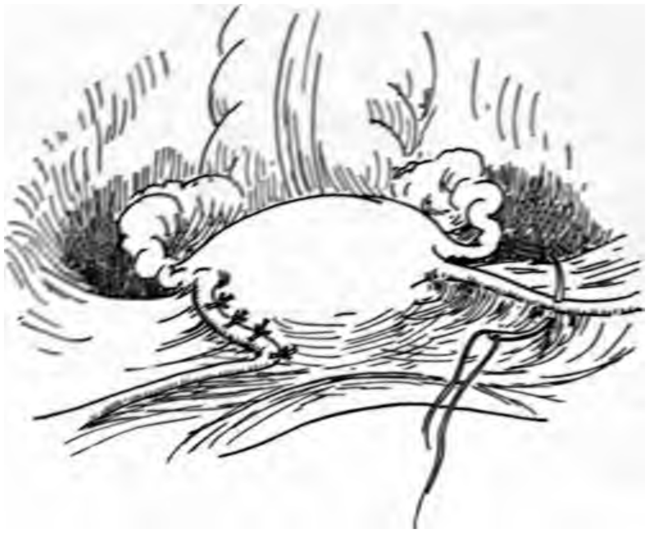


FIG. 225.—(85) COFFEY PROCEDURE FOR COMBINED SHORTENING OF THE ROUND AND BROAD LIGAMENTS. (a) The method of stitching the first fold of the round ligament to the uterus is shown. (After Coffey.)

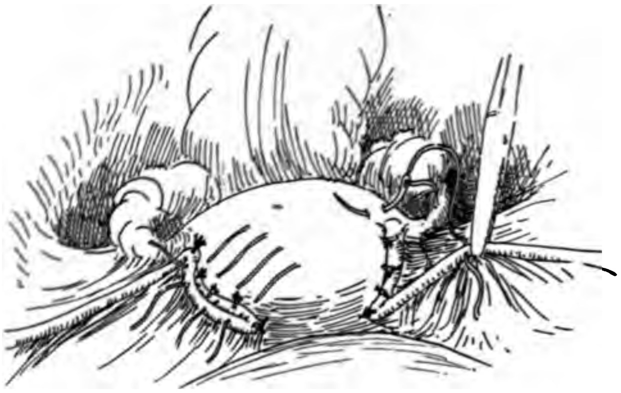


FIG. 226.—(85) COFFEY PROCEDURE FOR COMBINED SHORTENING OF THE ROUND AND BROAD LIGAMENTS. (b) Stitching the second fold of the round ligament to the uterus.

to the anterolateral border of the uterus, at the beginning of the vesicouterine fold.

(3) Place three or four similar sutures between this point and the

uterine end of the ligament (Fig. 225). Thus a double fold of the broad ligament is brought over to the side of the uterus.

(4) Seize the ligament an inch and a half farther on and bring it up to a point just above and internal to the uterine end of the round ligament, and fasten with a chromicized catgut suture.

(5) Place three or four more sutures between this and the first suture at the vesicouterine fold (Fig. 226). Thus, two more peritoneal or broad ligament layers are brought over to the side and front of the uterus.

(6) With a No. 1 or No. 2 chromicized catgut continued suture bring a fold of peritoneum from each side over the line of interrupted chromicized sutures.

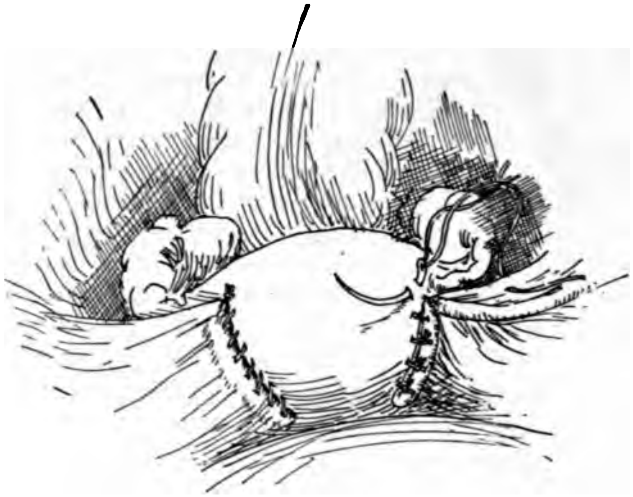


FIG. 227.—(85) COFFEY PROCEDURE FOR COMBINED SHORTENING OF THE ROUND AND BROAD LIGAMENTS. (c) The fold of the broad ligament stitched over the round ligament on one side, and the initial stitch for the same purpose on the other side.

(7) This continuous suture may include as much of the peritoneum as necessary to bring it taut; care must be used to avoid passing it in the bladder (Fig. 227). Be careful not to include the entire thickness of the round ligament in any of the rows of sutures.

86. GOFFE PROCEDURE FOR SHORTENING THE ROUND LIGAMENTS BY THE VAGINAL ROUTE

The following is a slight abbreviation of Goffe's description of this operation, viz.:

(1) A transverse or semilunar incision is made through the vagina in front of the cervix, as for vaginal hysterectomy, and the bladder

is dissected from the uterus with finger and the handle of the scalpel up to the vesicouterine pouch.

(2) The edge of the transverse incision is seized by two hemostatic forceps at either side of the middle point, and sufficient tension made to put the anterior vaginal wall upon the stretch, and an incision through the vaginal wall is then made with the knife from the neck of the bladder to the middle of the transverse incision.

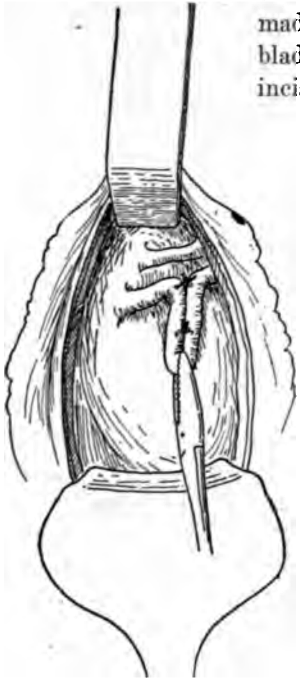


Fig. 228.—(86) Goffe Procedure for Shortening the Round Ligaments by the Vaginal Route. (a) The uterus has been dissected from the bladder, the left horn exposed, the left broad ligament brought down in a loop and a preliminary suture fixed in the loop near the base of the Fallopian tube which is shown.

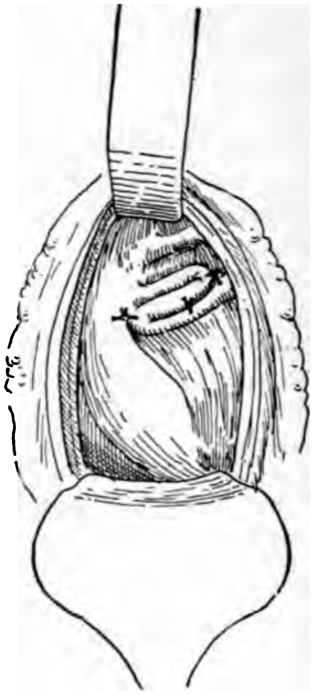


Fig. 229.—(86) Goffe Procedure for Shortening the Round Ligaments by the Vaginal Route. (b) The loop of the round ligament is stitched to the horn of the uterus.

(3) Through this incision the bladder is dissected free from the vaginal wall upon either side, and the finger is now forced through between the bladder and uterus into the peritoneal cavity.

(4) The second index finger is also carried through the opening,

and by pressure in opposite direction the peritoneum is torn across the face of the uterus and out into the broad ligament.

(5) One index finger is then hooked over the free border of one broad ligament, and carried down its posterior face until it can compress the round ligament against the thumb of the same hand which has been opposed to it in front of the broad ligament.

(6) With the round ligament so grasped the horn of the uterus is dragged forward and downward into the vagina, the cervix in the meantime being pushed back into the hollow of the sacrum, and the traction forceps released.

(7) The perineal retractor, which with all other retractors has been removed during the preceding manipulation, is now reintroduced, and a lateral retractor also in that side of the vagina on which the round ligament is first to be shortened.

(8) By raising the fundus between the thumb and finger and sliding the finger along the posterior face of the broad ligaments the different structures there may be brought into view. The Fallopian tube is here encountered and must be carefully avoided.

(9) Pressing the broad ligament forward, and following it down with the eye along its anterior surface, the round ligament will come into view. This should be followed out toward the internal ring and grasped with a hemostatic forceps about two and a half inches from the uterus, and dragged down in a loop (Fig. 228).

(10) This loop is then sutured to the exposed horn of the uterus (Fig. 229).

(11) The other round ligament is then similarly treated and the wound closed.

This operation is available only in cases of relaxed vagina; it fails to place other and undiscovered intrapelvic conditions under control, and it is obviously more difficult to do by one not accustomed to working by the vaginal route. Its results cannot be better than those realized by less difficult methods.

TREATMENT OF CONDITIONS ASSOCIATED WITH RETRODISPLACEMENT OF THE UTERUS

87. PROCEDURES FOR THE CORRECTION OF CONDITIONS THAT ARE PERSISTENTLY CAUSATIVE OF RETRODISPLACEMENT OF THE UTERUS

There are certain conditions that act as persistent causes in perpetuating retrodisplacements of the uterus. Certain of these conditions, such as injuries of the vagina, bladder, and rectum, have already been discussed and their treatment given (q. v.). Certain others, such as neoplasms of the uterus and ovaries, will be presented in later chapters (q. v.). Still other conditions, such as displacements of the stomach, colon, intestines, and omentum, are beyond the scope of this work. They are mentioned in this connection simply to emphasize the fact that the logical treatment of retrodisplacements of the uterus must embrace the treatment of all persistently causative conditions. So emphatically do I believe this that in all cases of retrodisplacement that I have treated during the last five years, and in which I have been able to demonstrate the existence of coloptosis by means of the X-ray, I have shortened the gastromesocolic ligament, done a retroperitoneal omentopexy for the fixation of the colon, and, when indicated, I have done a gastropexy. These conditions should be carefully looked after in every case.

88. PROCEDURES FOR THE CONTROL OF PERSISTENTLY RESULTANT CONDITIONS IN RETRODISPLACEMENTS OF THE UTERUS

In all cases of flexion of the uterus, whether anterior or posterior, in which the condition has been of long standing, two important changes will have taken place at the point of angulation. On the under or concave side there will have occurred marked atrophy with thinning and weakening of the wall. On the convex side the wall will have become elongated and hypertrophied. If, now, the uterus is straightened the effort will not be assisted by the concave or thinned and weakened wall, while it will be resisted by the hypertrophied and redundant convex wall. To restore the relative balance of these walls, following the initiative of Thiriar, but by important modification of his technique, I in 1894 began doing the operation of cuneihysterectomy—or the removal of a cuneiform segment from the convex wall at the apex of curvature. As applied to retrodisplacements the procedure as I carry it out is as follows:

89. THIRIAR-REED PROCEDURE FOR INTRAABDOMINAL CUNEIHYSTERECTOMY IN CASES OF RETRODISPLACEMENTS OF THE UTERUS

(1) An incision about 12 cm. in length is made in the median line and is carried as low as practicable with safety to the bladder.

(2) The patient is now placed in the Trendelenburg position.

(3) All adhesions between the uterus and bladder, or between the uterus and other organs, are carefully broken up, and rents in the serosa that may be induced thereby are carefully stitched. The uterus is then brought up into the incision by gentle but firm traction.

(4) An ellipse of tissue about 1 cm. wide, and having a length corresponding to the breadth of the organ, is removed from the con-

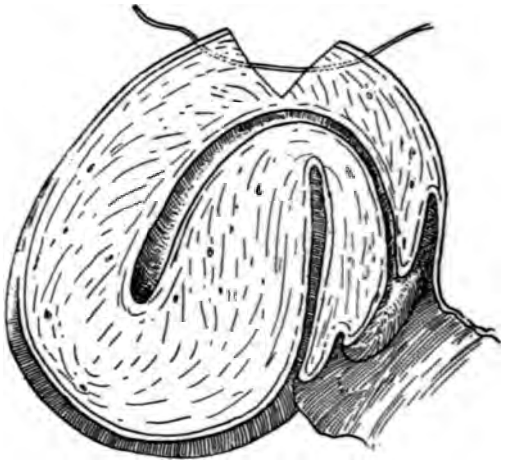


FIG. 230.—(89) THIRIAR-REED PROCEDURE OF CUNEIHYSTERECTOMY FOR FLEXION OF THE UTERUS. (a) Atrophy of the concave wall at the point of flexure and corresponding redundancy of the convex wall, from which a cuneiform segment has been removed. Several sutures like the one represented, or a continuous suture, when tightened, will straighten the uterus.

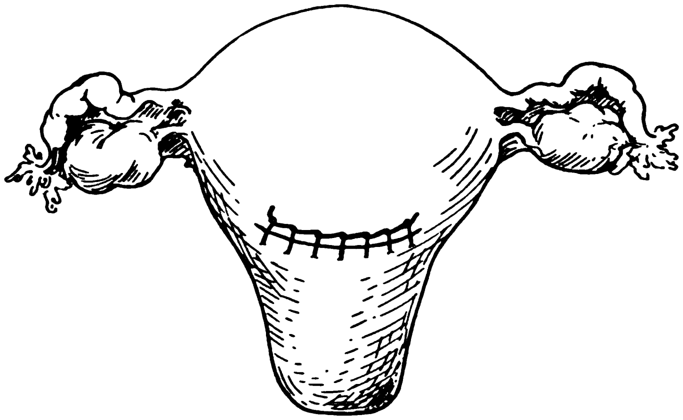


FIG. 231.—(89) THIRIAR-REED PROCEDURE OF CUNEIHYSTERECTOMY FOR FLEXION OF THE UTERUS. (b) The cuneihysterectomy incision has been closed by continuous hemostatic suture of chromicized catgut.

vex side at the site of flexure (Fig. 230). Care must be taken not to carry this dissection into the cavity of the uterus, or to wound either the circular artery or the anastomosing branches of the uterine arteries.

(5) The margins of the ellipse are carefully approximated and closed by a continuous hemostatic suture of chromicized catgut (Fig. 231), fortified with two or three interrupted ones. It is rarely, if ever, necessary to have this suture.

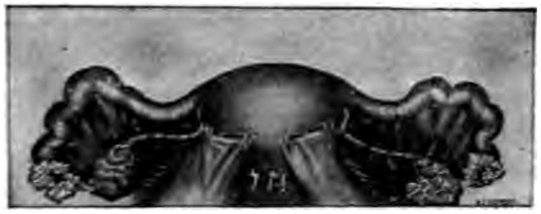


FIG. 232.—(89) THIRIAR-REED PROCEDURE OF CUNEIHYSTERECTOMY FOR FLEXION OF THE UTERUS. A further modification, consisting in stitching a reef of the posterior folds of the broad ligament to either side of the posterior surface of the uterus.

(6) The uterus is then dropped back, and, after pausing a moment to make sure of complete hemostasis, the abdomen is closed without drainage.

The same procedure applied to the posterior wall is applicable in anteflexion (q. v.).

TREATMENT OF ANTERIOR DISPLACEMENTS OF THE UTERUS

The treatment of forward displacements of the uterus, aside from surgical measures, has been unsatisfactory. Surgical treatment in this condition is intended (1) to relieve stenosis of the cervix due to angulation at or below the cervicocorporeal juncture; (2) to restore the entire uterus to its normal poise and axis; (3) to relieve the pressure from the bladder and rectum; (4) to remove persistently sequent conditions; and (5) to remove persistent causes of the condition. Pessaries, while occasionally affording temporary relief, have more frequently caused discomfort and damage. Graily Hewitt's cradle pessary at one time had a considerable vogue, but it, like its congeners, is now generally abandoned. The judicious use of tampons has been attended with comfort and followed by substantial improvement. When acute pain exists with forward displacements the patient should go to bed, take a laxative, and tampons. A case that can be controlled by a pessary can, in all probability, be relieved with equal efficiency and greater comfort by the measures just enumerated. When, however, in spite of careful attention to the details given forward displacements exist to such a degree as to interfere with health, recourse should be had to surgical treatment.

90. PROCEDURES FOR THE RELIEF OF CERVICAL STENOSIS INDUCED BY ANTEFLEXION OF THE UTERUS

These procedures are made necessary largely for the relief of the dysmenorrhea that results from mechanical obstruction, partial or complete, of the cervical canal due to angulation. Efforts to straighten the canal by straightening the uterus are sometimes followed by very transient relief.

Massage of the Uterus.—This is sometimes done by massage of the uterus during menstruation. The patient is placed in dorsal position. The left index finger is placed in the vagina and the right hand is placed over the lower abdomen. By a series of manipulations the effort is made temporarily to take the bend out of the uterus and thus, for the moment, to relieve the obstruction. The effort is called for by extreme uterine pains at the menstrual period, and is sometimes successful in relieving an attack.

Divulsion and Curettage of the Uterus.—Divulsion and curettage of the uterus by strong mechanical dilators is a more satisfactory form of treatment. The forcible stretching of the canal, if thorough and if repeated a few times, after short intervals, may result in sufficient permanent enlargement of the canal to remove the obstruction and thus cure the dysmenorrhea. Granular endometritis is present in a large majority of these cases. This calls for curettage.

91. PROCEDURE FOR DIVULSION AND CURETTAGE OF THE UTERUS

(1) The patient is in the dorsal position with the thighs well flexed.

(2) The posterior lip of the cervix is seized, drawn down gently by volsellum forceps.

(3) Small slightly curved dilators are gently introduced beyond the internal os, gradually spread, and then removed.

(4) A large strong dilator, such as Ellinger's or Goodell's; should be introduced and gradually opened. This process should continue until the cervix is dilated about 2 cm. The time occupied in this maneuver varies according to the resistance of the tissues, but it should not be hastily done—from five to ten minutes are generally required.

(5) An Emmet curette forceps should then be introduced to explore the uterine cavity for granular tissue. If none is found the operation may be considered as completed.

(6) If granular tissue is found a sharp curette should be introduced and the granulations scraped away. This should be done sys-

tematically and the mind should follow the curette around the entire circumference of the cavity.

(7) The uterine cavity should then be mopped out with pure 98 per cent. carbolic acid, followed with alcohol.

(8) Some sterile gauze or an Otterbridge dilator should then be introduced. If gauze is used it may with advantage be saturated with sterilized glycerin for its exosmotic effect. It should be withdrawn after from 24 to 48 hours. The Otterbridge dilator should be left in for a week.

After-treatment.—The patient should remain in bed from 4 to 7 days; have douches twice daily; be given gentle laxatives; these should be supplemented by enemas. Uterine cramp, that generally occurs during the first forty-eight hours, is caused by the presence of the gauze packing in the uterus. It is an advantage, as it has a tendency to reduce an enlarged uterus. It should not be treated with anodynes, but after an hour or two the packing should be removed, when the cramps will cease.

92. DUDLEY PROCEDURE FOR ANTEFLEXION OF THE UTERUS

This procedure is designed to eliminate obstruction by straightening the cervical canal.

(1) The patient is placed in Sims' position and the speculum is introduced under ether.

(2) The uterus is then dilated and curetted as described in the preceding paragraph.

(3) The cervix is divided with scissors, backward in the median line, past the uterovaginal attachment, nearly to the uteroperitoneal fold, in the pouch of Douglas (Fig. 233).

(4) The cut surfaces thus incised are then held widely apart by means of two tenacula in the hands of an assistant.

(5) The incision is somewhat deepened by means of a scalpel. especially in the uterine wall next to the cervical canal, and a small angle is cut out on either side.

(6) The cut surface on each side is now folded on itself by a single silkworm gut suture. This suture is tied and fortified by interrupted sutures on either side.

Dudley explains that these sutures are not introduced in such a manner as to stitch the intracervical to the vaginal margin of the wound, but the cut surface is folded upon itself in a direction at right angles to this. On either side that point at the margin of the os externum where the backward incision commenced is stitched to the very angle of the incision, so that each cut surface is folded upon itself, not from within outward, but from before backward. Thereby the os externum is carried directly back to the angle of the incision. The cervix now points backward in its normal direction toward the hollow of the sacrum, instead of forward toward the vaginal outlet.

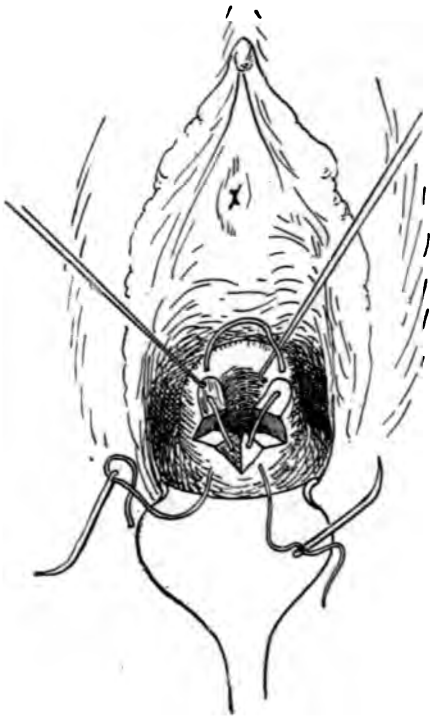


FIG. 233.—(92) DUDLEY PROCEDURE FOR STRAIGHTENING THE CERVICAL CANAL FOR ANTEFLEXION OF THE UTERUS.

93. THIRIAR PROCEDURE OF ABDOMINAL CUNEIHYSTERECTOMY FOR ANTEFLEXION OF THE UTERUS

The procedure of Thiriar was first devised as a remedy for anteflexion. My adaptation of it to retroflexion is given on a preceding page. The technique there described, applied to the posterior instead of the anterior wall, will serve as a practical guide under these conditions.

94. COFFEY PROCEDURE OF VAGINAL CUNEIHYSTERECTOMY FOR ANTEFLEXION OF THE UTERUS

Coffey's procedure for shortening the posterior wall of the uterus in cases of anteflexion is an adaptation of the Thiriar-Reed method (Pro. 89) to the vaginal route, and is as follows, viz.:

(1) Pull down the uterus and somewhat elevate the cervix.

(2) Incise the vaginal membrane at the back of the cervix and dissect up the peritoneum on the posterior surface of the uterus to the apex of the angulation.

(3) Cut out a V-shaped piece from the uterine wall.

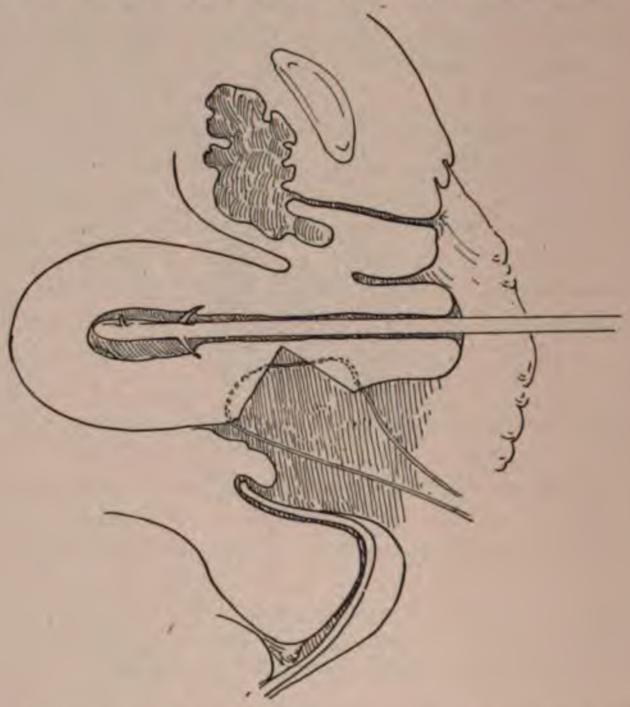


FIG. 234.—(94) COFFEY PROCEDURE OF CUNEIHYSTERECTOMY BY THE VAGINAL ROUTE. The drawing shows a special "cat claw" tenaculum which is not essential to the procedure.

(4) Close the opening thus made with slowly absorbing catgut sutures (Fig. 234).

(5) Replace the uterus and close the vaginal incision.

TREATMENT OF PROLAPSUS OF THE UTERUS

The treatment of prolapsus, or downward displacement, of the uterus resolves itself into (a) hygienic, (b) medicinal, (c) mechanical, and (d) surgical.

Hygienic Treatment.—Hygienic treatment, if judiciously selected, tends to minimize the discomfort due to downward displacements. This should first involve attention to all the secretory functions, and especially avoidance of errors in diet. Massage of the uterus has been recommended, and as a remedy for relieving passive engorgement or chronic hyperplasia it is of value and should be employed for the relief of prolapse, especially in its incipiency, whenever dependent upon these conditions. It should not, however, be employed in the presence of acute inflammation of either the uterus or its appendages.

Frequent recourse to the knee-chest position is of value, particularly if the perineum is at the same time so retracted as to submit the uterus to atmospheric pressure. To be effective the patient should be absolutely free from all constrictive clothing.

Medicinal Treatment.—Medicinal treatment consists, for the most part, in the administration of laxatives to overcome the constipation, which in many cases is a potent factor in the causation of the trouble. For this purpose saline waters should be given persistently in comparatively small doses after, but not before, meals. If given before meals they will cause catharsis, enervation of the bowels, and consequent aggravation of the constipation; but, if given after meals, they will mingle with the food, and after a couple of days induce normal dejections, not followed by serious consequences.

Cathartics may be supplemented with high enemas to secure the unloading of the entire colon. Physicians should, however, recognize the evil results of chronic cathartics and of enemas upon the intestinal tract, and should warn patients of these consequences. Patients may likewise be given tonics and supportives to increase the general tone of the system. It is of extreme importance, however, to remember that the constipation and intestinal pain in these cases are not so frequently due to either general debility or to the local condition of the uterus as to obstipation caused by the angulation of displaced intestines. It is manifest that in all such cases the continued employment of medicinal measures, whether laxatives or tonics, must be mischievous; the first because of their effects upon the intestines, the second because they consume valuable time, generally without improvement, but during which complications develop.

Mechanical Treatment.—Mechanical treatment involves the application of means to support the displaced uterus. This is accomplished by the application of various supports through the vagina. Under this head tamponade must be given first place. This should be practiced as elsewhere described in this volume. If tampons saturated with some astringent agent are carefully adjusted they will give excellent mechanical support and afford the relaxed ligaments an opportunity, as far as possible, to regain their strength. Pessaries are employed for the same purpose and a certain percentage of cures is realized from their employment, which, however, is not destitute of danger. The pessary with an intrauterine stem should never be employed; cup-pessaries are for the most part mischievous in their results, and, to avoid their damaging influence, must be frequently removed. The martingale ring of hard rubber may keep the uterus within the pelvis, but it does so by distending the vagina laterally and by resting upon the pelvic floor. The inflated, soft-rubber pessary has an even better power of retention, but it is at best a dirty and stinking thing, and should be used only when other means of treatment are not available. This instrument is very popular with practitioners because of the facility with which it is placed, and the effectiveness with which it keeps the womb from dropping out of the vulvar orifice. The fact, however, is generally lost sight of that this pessary never cures prolapsus in the sense of restoring the uterus to its normal position and keeping it there, and but few practitioners take into account the other fact, namely, that by a continuous pressure upon the pelvic floor and by persistent lateral distention of the vagina this instrument has a tendency really to aggravate preëxisting troubles, notwithstanding the fact that it affords temporary relief. The soft-rubber pessary favors germ propagation and is, therefore, a constant menace to the health.

Surgical Treatment.—Surgical treatment has for its object the return of the organ to its natural position and its retention there by the restoration, so far as possible, of its normal anatomic connections. Any treatment, to be effective, must be carried out in full recognition of the fact that prolapse of the uterus commonly occurs as the result of either serious lacerations of the pelvic floor and the perineum or as the result of atrophy and relaxation of all the uterine supports. The final result is the same in each case. In a limited number of cases the injuries below are less the cause of the prolapse than is the great relaxation of the uterine ligaments, particularly the uterosacral. No prolapse can take place without relaxation of these ligaments.

The first step in a prolapse is always a retroversion; so that relaxation of the round and broad ligaments is a universal accompaniment of this condition. If with the relaxation of the round ligaments there is also relaxation of the uterosacral ligaments, then the uterus, following the axis of the pelvis, slowly and gradually makes its way downward under the influence of intraabdominal pressure, until it finally appears at the vulvar orifice, and may eventually be forced outside the patient's body. These being necessary concomitants of prolapse, all operative procedures must have for their object the restoration of the normal supports of the body. If these can not be restored then some new support must be sought. With the object of relieving the downward traction on the uterus operations may be performed on both the anterior and posterior vaginal walls. Unquestionably the best operations for this purpose are those devised by Sims and Emmet.

In arranging a plan of surgical relief for prolapse of the uterus it is, however, of great importance to remember that pressure from gastrocoloenteroptosis is probably the most frequent initial cause of the hernia, and that relief from this pressure is essential to prevent recurrence.

From this survey of the indications it is evident that surgical measures must resolve themselves into those for the restoration of (a) the lower supports of the uterus, (b) the upper supports of the uterus, and (c) for the removal of superimposed pressure from the uterus.

The restoration of the lower supports of the uterus is effected by the several procedures already described under Injuries of the Perineum, Injuries of the Vagina, Displacements of the Vagina, and Displacements of the Rectum (q. v.).

I have for a number of years had recourse to an operation that I have designated as superior colporrhaphy. This operation has for its object the restoration of the integrity of the vagina at the pelvic diaphragm, which is that continuity of structure stretching more or less irregularly across the pelvis at the upper extremity of the vagina. These are the structures first to give way in prolapse of the uterus. In very many cases the yielding of these structures has been antecedent to the descent and has resulted from parturition. In these instances there has been overdivulsion with laceration of the muscularis of the vagina, and the uterosacral ligaments with their associated structures have become elongated and permanently relaxed. The object is, of course, to restore these structures.

95. PROCEDURE FOR SUPERIOR COLPORRHAPHY IN CASES OF PROLAPSE OF THE UTERUS

(1) With the patient in the dorsal position the posterior wall of the cervix is seized at its juncture with the vagina and drawn downward and forward. A Newman intracervical volsellum is best employed for this purpose (Fig. 235).

(2) The vaginal membrane is now incised at the cervicovaginal juncture, transversely from one fornix of the vagina to the other. There is no object in entering the cul-de-sac, which might better be avoided, but if opened the accident is not important.

(3) From a point at the middle of the incision another from 4 to 5 cm. in length is made vertically downward in the vaginal wall.

(4) The triangular flaps thus outlined are dissected back, largely with the finger or with gauze, thus exposing the retracted margins of the sphincter vaginal muscle, the cellular tissue, and the more or less attenuated striæ of the uterosacral ligaments (Fig. 236).

(5) The cul-de-sac is pushed up out of the way.

(6) A series of silkworm gut sutures is now inserted, embracing first the uterosacral ligaments of both sides, and further down the retracted sphincter muscle and connective tissue.

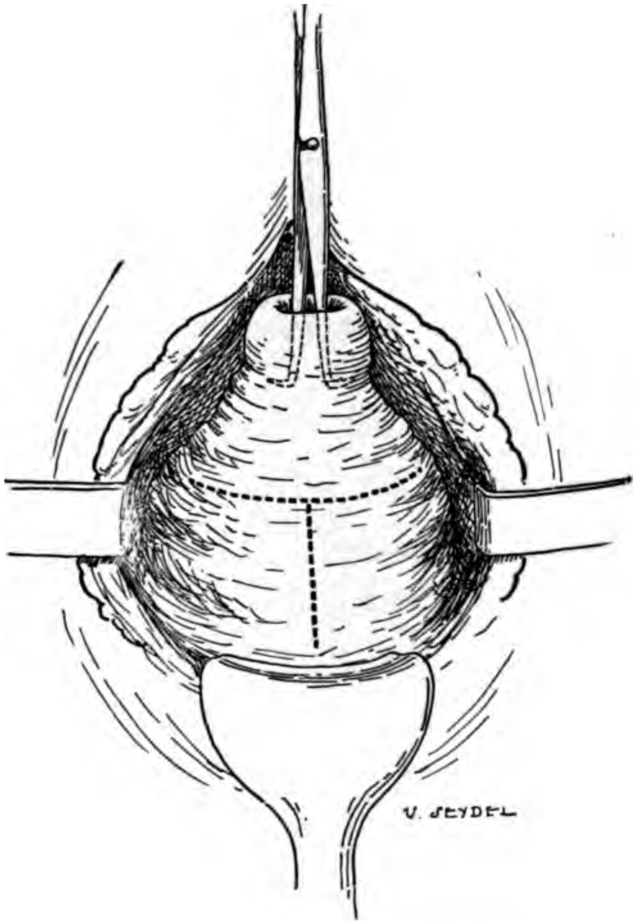


FIG. 235.—(95) PROCEDURE FOR SUPERIOR COLPORRHAPHY. (a) The cervix is drawn downward and forward by the Newman tenaculum forceps. The dotted line indicates the line of proposed incision.

(7) The loose ends of these sutures are crossed over and drawn to approximate the deep layers, and to determine the amount of redundancy in the vaginal membrane, but are not tied.

(8) The redundancy in the vaginal membrane is now cut away by trimming back the flaps (Fig. 237).

(9) The ends of each suture are now crossed over and inserted

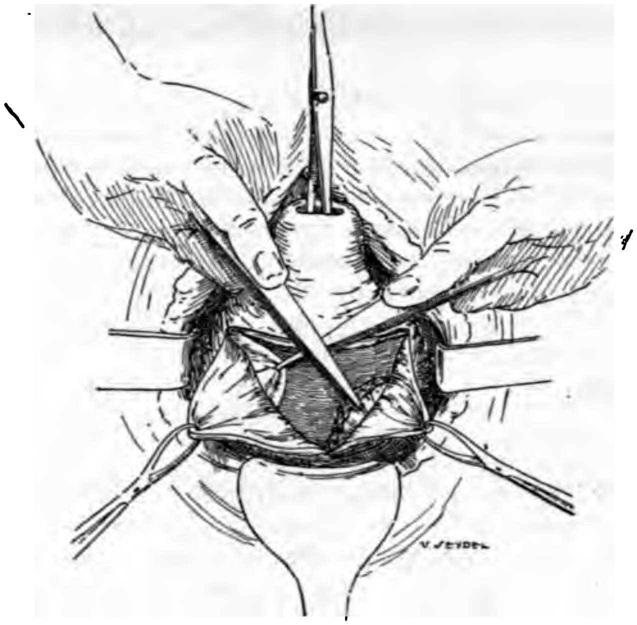


FIG. 236.—(95) PROCEDURE FOR SUPERIOR COLPORRHAPHY. (b) The flaps are dissected. The right uterosacral ligament is drawn down. On the left the torn and retracted sphincter vaginal muscle, designedly somewhat exaggerated for purposes of illustration, is drawn forward by the forceps.

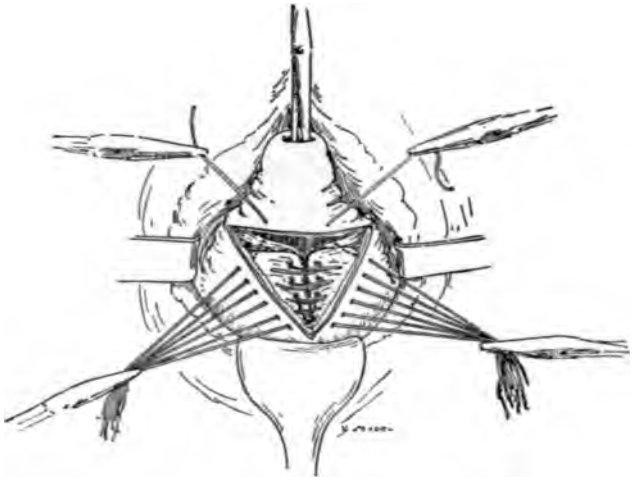


FIG. 237.—(95) PROCEDURE FOR SUPERIOR COLPORRHAPHY. (c) The redundant flaps have been cut away, the figure-of-eight sutures have been inserted, and are drawn taut to demonstrate the approximation of the uterosacral ligaments and the sphincter vaginal muscle.

through the opposite vaginal flap, thus making it a figure-of-eight suture. All the sutures are then tied and their ends left long to facilitate subsequent removal.

(10) If necessary a few interrupted catgut sutures are inserted in the transverse incision on either side of the vertical incision.

In cases of complete tear of the perineum with cystocele in the lower zone the two operations may be done at once.

It is important to remember that this operation is addressed to the correction of but one feature of prolapse of the uterus. Within those limitations it is important; and in my hands it has been successful in doing just what it was intended to do, viz., restore the integrity of the upper zone of the vagina and the supportive capacity of the uterosacral ligaments.

96. BOVEE PROCEDURE FOR SHORTENING THE UTEROSACRAL LIGAMENTS IN PROLAPSE OF THE UTERUS

(1) With the patient in the lithotomy position, the perineum retracted, the cervix is drawn down and forward with a retractor, exposing the posterior vaginal fornix.

(2) An anteroposterior incision is made down to the peritoneum from the cervicovaginal juncture to the rectum.

(3) By careful dissection the ligaments are brought into view.

(4) One ligament is grasped in the middle with forceps and is brought down in the form of a fold into the vagina.

(5) A curved needle armed with a slowly absorbent ligature is passed through the ligament at the extreme points, and another through the loop thus formed and through the posterior portion of the cervix below the insertion of the ligaments.

(6) The other ligament is treated in the same way, all sutures are tied, and the vaginal wound closed by interrupted sutures.

Bovée states most correctly that this operation is difficult to perform, and that it is eligible only in cases in which the vagina is relaxed and in which the prolapse is more or less marked.

97. PROCEDURE FOR SHORTENING THE UTEROSACRAL LIGAMENTS BY THE ABDOMINAL ROUTE

(1) With the patient in the extreme Trendelenburg posture the abdomen is freely opened by median incision and the intestines, forced into the abdominal cavity, are walled off by gauze roll.

(2) The uterus is drawn upward and forward into the field of operation, thus making the uterosacral ligaments taut.

(3) (a) With a curved needle a suture, preferably of linen, is in-

serted in one ligament near its sacral extremity and tied, both ends being left long. (b) The needle end of the thread is then passed through the uterine end of the ligament. (c) Both ends of the thread are again tied to each other. (d) The margins of the ligament are stitched together by continuous suture, drawn tightly, down to the point of the loop thus formed and back again, where it is again tied to the loose end. (e) Both ends are then cut short.

(4) The other ligament is treated in the same way.

This operation is sometimes difficult because of the inability to bring the ligaments far enough up into the field. The permanency of its results depends upon the accuracy, bite, and firmness of the sutures. If loosely applied the endothelium on the approximated surfaces will not absorb, and the tissues will not weld.

TREATMENT OF THE LATERAL DISPLACEMENTS OF THE UTERUS

These displacements practically always depend upon some intrapelvic condition outside the uterus itself. Their treatment, to be rational, must, therefore, be addressed primarily to such causative conditions, among which may be mentioned infections of the uterine appendages and neoplasms of either the uterus or ovaries or both. In view of these facts an attempt to treat these cases systematically by any form of manipulation or mechanical appliance would be unduly hazardous. The initial step should be an exploratory abdominal incision, to be followed then and there by such procedure as may be demanded by the conditions revealed.

TREATMENT OF INVERSION OF THE UTERUS

For the treatment of inversion of the uterus see division on Surgical Conditions of Pregnancy and Parturition.

CHAPTER III

DISPLACEMENTS OF THE FALLOPIAN TUBES

The normal position of the Fallopian tubes is along the crest of the posterior folds of the broad ligament on either side of the uterus. Their free ends fold normally backward toward the ovary. They have a normal range of mobility of about 1 cm.

Displacements of the Fallopian tubes are (a) congenital and (b) acquired.

Congenital displacements have been considered in the division on Malformations.

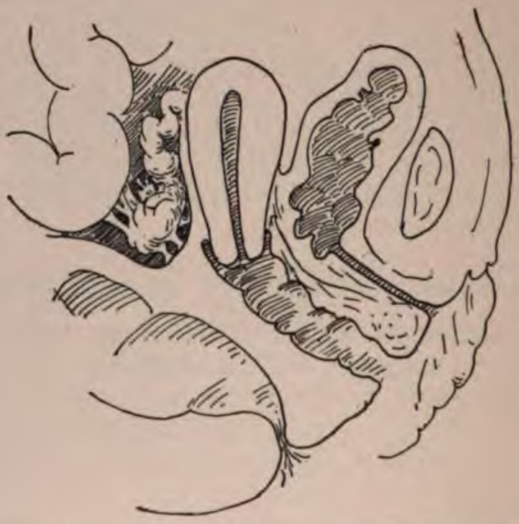


Fig. 238.—Displacement of the Ovary into the Cul-de-sac with Adhesions to the Peritoneum and to the Ileum. The Fallopian tube has been displaced with the ovary.

Acquired displacements are associated with either infection of the tubes or with displacements of other organs, such as the uterus, ovaries, and intestines, or with neoplasms of the uterus or ovaries.

Infection of the Fallopian tubes causes their displacement by increasing their weight and causing them to gravitate either to the anterior or posterior side of the broad ligament. They usually drop backward into the cul-de-sac, burying the ovaries under them (Fig. 238). In this position they become adherent (see Infections of the Fallopian Tubes under the title of the different infections).

Displacements of the uterus or ovaries may carry the Fallopian tubes to a certain extent with them. I have seen the Fallopian tube thus carried with an ovary into a femoral hernia. Fibroids and cysts, especially the so-called intraligamentary variety, may lift the Fallopian tube of the affected side far up into the abdominal cavity. I have seen the tube thus elongated to 23 cm., riding above the umbilicus on the wall of a large cyst in the wall of which it was imbedded.

Symptoms and Diagnosis of Displaced Fallopian Tubes.—Displacements of the Fallopian tubes have no definite symptomatology. The symptoms present in a given case are those of the underlying causative condition. The diagnosis is generally made incidentally to intra-abdominal operations for other purposes.

Treatment of Displaced Fallopian Tubes.—This should be addressed to the condition upon which the displacement depends. An exploratory abdominal incision is the initial step of rational treatment. Nothing can be more hazardous than to assume that a given case is one of displacement of the Fallopian tubes, and then to attempt to treat it by pelvic massage or other manipulative measures, or by any sort of pessary or other mechanical appliance.

CHAPTER IV

DISPLACEMENTS OF THE OVARIES

The anatomical connections and relations of the ovary render it difficult to determine the precise normal locus of the organ; attached as it is by the ovarian ligament, and resting as it does on the fold of the broad ligament, it enjoys normally a considerable range of mobility. This seems to be a wise provision of nature, whereby the sensitive organ is enabled to evade what would otherwise be painful pressure from neighboring structures, such as the uterus, the cecum, the sigmoid, and even the overloaded bladder. The ligamentum ovarii proprium is firm and round, consisting of fibromuscular elements, is covered by peritoneum, has a length of about 2.6 cm., and is essentially inelastic; while the duplicatures of peritoneum, which comprise the remaining suspensory apparatus of the ovary, and permit that organ to ascend with the fundus uteri during pregnancy, are highly elastic. It is to be seen, therefore, that to an important extent the position of the uterus determines the position of the ovary. The ovary moves with the uterus and, to some extent, independently of it.

Displacements of the ovary may be either congenital (see Malformations of the Ovary) or acquired. An acquired displacement may occur in any direction. It may be carried up, or pushed to one side, or forced downward by a neoplasm of the uterus, or of the other ovary, or by a distended Fallopian tube. In this way the organ is forced into a distinctly abnormal position. Thus, it is occasionally found posterior to the uterus and riding upon the uterosacral fold of the peritoneum; in other instances it gravitates into the cul-de-sac, often becoming adherent; in a few cases it has been found adherent between the uterus and the bladder, while in still other cases it has been found adherent to the intestines and drawn by them well above the brim of the pelvis.

In the majority of instances displacement occurs into the cul-de-sac, where the ovary is liable to become adherent to the peritoneum and to the intestines (Fig. 238).

The ovary is occasionally carried with the omentum or the intestines, or both, into a hernial sac. This condition may exist at birth, or it may develop in old age; and it generally consists in a descent of the organ through the canal of Nuck, which persists in many cases. It is encountered clinically as an inguinal hernia. Mencière has reported 4 cases of hernia of the ovary occurring in children, and has been able to find 7 others on record. All 11 were inguinal, 9 were on the left and 2 on the right side, and in one instance the uterus, as well as both tubes and ovaries, lay in the sac.

Browne, after a careful study of hernia of the ovary, concluded that the condition was of more frequent occurrence than was generally supposed. He attributes congenital hernia of the ovary chiefly to arrest of development during intrauterine life, and finds that it is always inguinal, often double, and, when single, generally on the left side. The formation of this condition is favored by the persistence of the canal of Nuck and by the size and shape of the ovary, which is at first a long flat body with its apex pointing toward the canal.

The fact that at birth the ovaries are situated above the iliopectineal line, and descend during the first few months into the true pelvis, is also recognized as a contributory causal circumstance.

Hernia of the ovary is generally associated with corresponding descent of the Fallopian tubes, and, as in Mencière's case, the uterus, too, may be found in the sac. Acquired hernia, on the other hand, is not always inguinal, but may occur through any ordinary hernial opening. The condition generally occurs with preëxisting intestinal or omental hernia. The condition is generally unilateral, occurring more frequently on the right side. Labor and the post-parturient relaxation of the tissues are recognized as the chief causes.

Symptoms and Diagnosis of Displacements of the Ovaries.—Displacement of the ovary may be and frequently is one of the most painful of conditions. If the displaced ovary is so situated that it is the recipient of even slight but more or less persistent pressure from superimposed organs it speedily revolts. Intense pain is complained of, with focus of intensity in the autonomic area above Poupart's ligament. A certain amount of sacralgia and coccydinia are complained of, and various neurotic phenomena are developed. If the ovary lies in the cul-de-sac it can be felt on the finger within the vagina. The slightest touch gives intense pain—a fact that explains why sexual intercourse in these cases is generally the occasion of great distress. The pain induced by touching the displaced and irritated ovary is a peculiarly intense depressing pain, sometimes occasioning symptoms of shock.

If the ovary is in a hernial sac the symptoms may be confused from the fact that omentum or intestine, or both, are generally extruded with it. In the congenital form this complication is less likely to occur. In such cases the hernia exists as a small painful nodule, lying at the orifice of the inguinal canal. In consequence of the contraction of the tissues after the descent of the organ the hernia is generally irreducible, any effort to push the tumor back being the cause of extreme and depressing pain, which may produce symptoms of shock. The absence of crepitus in the tumor and of the usual reflex intestinal symptom indicates that the bowel is not involved in the protrusion. The tumor may, however, be the seat of important changes, induced either by strangulation or by organic degeneration of the ovary. In the acquired form of hernia the intestine and omentum are more liable to be found in the hernial sac, which, as already intimated, does not always protrude through the inguinal canal. One of the most perplexing forms of hernia of the ovary is that in which the protrusion occurs through the obturator canal. Von Rogner Gusenthal describes a case in a patient sixty-six years old. There were symptoms of strangulation, with pain and indistinct gurgling, but no distinct tumor, in the right groin; femoral hernia was diagnosticated. On operation the crural canal was clear, but a bulging was seen under the pectineus muscle. The muscle was divided and the sac of the hernia, in a gangrenous condition, bulged forward. This contained the right ovary and tube and a coil of intestine, all gangrenous.

Treatment of Displacements of the Ovaries.—An ovary displaced into the cul-de-sac, but not adherent and not held down by some superimposed weight, as by a neoplasm, may be replaced and the patient thus temporarily relieved—but only temporarily. If the patient is placed in the knee-chest position and the perineum retracted, the ovary will often drop out of the cul-de-sac without further assistance. Digital pressure against the ovary, while the patient is in this position, will facilitate the reduction.

If an effort of this kind demonstrates that the ovary is immovable further manipulations should be discontinued. Massage and electricity are both mischievous.

98. PROCEDURE FOR REPLACEMENT OF THE DISPLACED OVARY

(1) The patient in the Trendelenburg position, and a free median abdominal incision having been made, the ovary is freed from all adhesions.

(2) It is then brought up and a suture of linen is passed through the ovarian ligament and through the margin of the broad ligament, care being taken not to include the ovarian artery in the suture. One or two similar sutures may be added. The very ingenious pleating suture of Berkeley and Binney may be utilized (Figs. 239, 240).

(3) The other ovary is given similar treatment if demanded by its position.

This operation of fixation should not be carried out to a conclusion if the ovary itself is hopelessly diseased, or if the Fallopian tube is functionally impaired beyond repair. Under such circumstances the question of ablation should be taken under serious consideration.

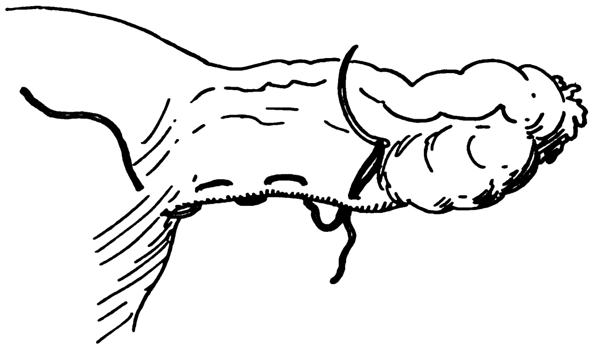


FIG. 239.—(98) BERKELEY AND BINNEY PROCEDURE FOR REPLACEMENT OF DISPLACED OVARY. (a) The pleating suture is applied, the uterine end of which is made to embrace uterine tissue, care being taken not to wound the uterine artery.

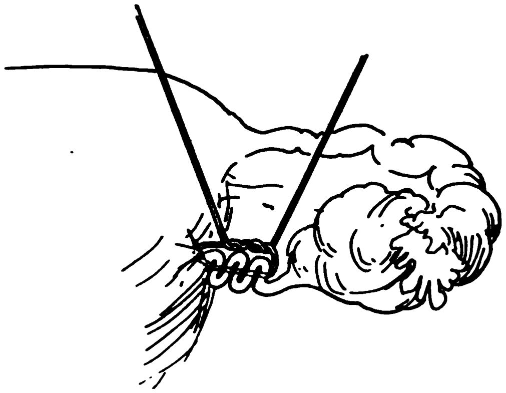


FIG. 240.—(98) BERKELEY AND BINNEY PROCEDURE FOR REPLACEMENT OF DISPLACED OVARY. (b) The suture is tied with pleating effect on the ovarian ligament.

If the ovary is in a hernial sac operation should be done without delay. If the ovary and tube are otherwise normal they may be returned to the pelvic cavity. If the ovary is found to have undergone such morbid changes as to render its return to the peritoneal cavity unjustifiable both the ovary and tube should be removed (see Procedure for Salpingo-oöphorectomy). In infantile cases, however, the organ may be saved in many instances. In 11 cases collected by Mencière cure resulted in 10, in 8 by radical operation, in 2 by reduction and bandaging.

For *displacements of the bladder* see Displacements of the Vagina, and Cystocele.

CHAPTER V

DISPLACEMENTS OF THE KIDNEY

Anatomical Considerations.—The kidney, when in its normal position, is so protected by the ribs and muscles that it can not be palpated. It is so surrounded by a cushion of fat and connective tissue that it has a normal range of mobility of from 1 to 2 cm. It is true that it sometimes has a range of mobility of as much as 3 or 4 cm. without inducing symptoms, but it does not follow from this that such mobility can be called normal, for the simple reason that such mobility is incompatible with the average standard of anatomic relations. As a matter of fact, any degree of mobility that does induce symptoms is to be called abnormal and calls for correction.

Incontestibly the most valuable recent contribution to this subject was Longyear's demonstration in 1905 of the nephrocolic ligament and the rôle it plays in the induction of ptosis of the kidney and in the restoration of the organ to its natural relations.

The nephrocolic ligament is a bundle of connective tissue striæ—"an irregularly shaped aggregation of fasiculi"—extending from the fibrous capsule of the kidney downward to the posterior wall of the ascending colon and of the cecum on the right, and of the upper curve of the sigmoid on the left. When, as early as 1895, I first noticed these striæ I thought they were adventitious, and probably of inflammatory origin. It now seems, from a recent somewhat exhaustive research of the literature, that my experience was not singular. Thus, Hahn, whose observation extends back to his inauguration of the practice of kidney fixation in 1881, says that "fibers run from the tunica fibrosa in front and behind to the subperitoneal fascia." Newman, of Glasgow, observes that "frequently in long-standing cases the fat becomes infiltrated with connective tissue, making it tough and fibrous, and when this altered capsule is stitched to the parietes the kidney can be maintained in its position without suturing the organ itself." Carwardine, of Bristol, says: "It is common in cases of wandering kidney to meet with strong fibrous bands, some of which require scissors or scalpel for their division." Longyear, of Detroit, was the first to describe these striæ as comprising a distinct and significant structure.

His subsequent study prompted him to the conclusion that "this framework of the fatty capsule is probably the tissue left in the track of the ovary or testicle in its descent from the Wolffian body high up near the kidney." As the structure thus became recognized as of definite embryonal origin he called it a "ligament," and as it extended from the lower extremity of the tunica fibrosa of the kidney to the cecum on the right and to the sigmoid on the left he called it the "nephrocolic ligament." In recognition of this valuable contribution others have called it "Longyear's ligament." But whether the structure may with propriety be called a "ligament," in view of the restrictive meaning of that word, may well be open to doubt. At any rate the structure may be designated as nephrocolic striæ. It occurs as a definite anatomic element in all of my cases.

Occurrence.—Movable kidney is a very common condition, but statistics based upon dead-house reports are very misleading. This unreliability of dead-house statistics, as explained by Harris, is due mainly to two reasons: first, the condition rarely plays any direct part in the cause of death, and consequently is frequently overlooked; and, secondly, when the patient assumes the recumbent position the kidney usually returns to its normal location, and the post-mortem solidification of the perirenal fat limits its degree of mobility. We, therefore, turn to clinical experience to determine the frequency of this condition. Küstner examined in order 1,733 patients as they applied to him in private practice, and found 44 cases of movable kidney. There were 828 men with 4 cases, or 0.48 per cent., and 905 women with 40 cases, or 4.41 per cent. This is a good illustration of the general average in a surgical practice. In an exclusively gynecological practice the percentage is much higher, as not far from 20 per cent. of such cases will be found to have "movable" kidney (Edebohls).

Etiology.—In considering the etiology of movable kidney two facts stand out so prominently that all etiological factors must be consistent therewith. These are: first, the proportion of women affected is greatly in excess of men; secondly, the right kidney is affected much more frequently than the left. In 667 cases collected by Küstner 584 subjects were women and 83 men. The explanation of this marked predominance of women over men is found in the body form. The upper or cephalic portion of the abdominal cavity is relatively of much smaller capacity in women than in men. The cavity is not only contracted laterally but from before backward as well. The effect of this is to displace and distort the organs occupying this zone of the abdomen. The stomach lies in a more longitudinal direction and the pylorus is depressed. The liver is compressed from before backward, thus depressing its anterior and posterior borders. The depression of the posterior border crowds the right kidney lower and tends to displace or tilt the superior pole in an anterior direction. The increased breadth of the female pelvis gives to the psoas muscles a more oblique direction than in the male. This condition produces an obliquity in the sagittal axis of the kidney, so that the superior pole lies nearer the middle line than the inferior. The relation between the body form and the location of the kidney is so constant that, by dividing the length of the body from the suprasternal notch to the upper border of the symphysis pubis by the least circumference of the body, an "index" will be found from which it may confidently be predicted in a given case whether the kidney will be found palpable or not. The formula of this index, as expressed by Becker and Lennhoff, is as follows:

$$\frac{\text{distance jugulosymphysis}}{\text{least abdominal circumference}}\ 100 = \text{index}.$$

The greater the index the smaller the upper zone of the abdomen, and *vice versa*. Therefore, the greater the index the lower the kidney will be found. With an index above 77 the kidney is almost always "palpable," while with an index below 75 it is the exception to find a "palpable" kidney. The body form must, therefore, be considered the predisposing factor in the cause of "movable" kidney, and explains the predominance of movable kidney in women over men.

The chief determining cause of displacement of the kidney, according to M. L. Harris, is mechanical insult to the kidney. Mechanical influences may be divided into internal and external, the former being the more common and important. By internal mechanical influences are meant all sudden or severe muscular strains, such as heavy lifting, wrenching of the body by slipping or falling, straining at stool, coughing, twisting and turning of the body, in fact, any muscular action that produces adduction of the lower movable ribs and thus a constriction of the upper zone of the abdominal cavity. In body forms with high indices it will be found that the plane corresponding to the least abdominal circumferences cuts the distal portion of the floating ribs in women and passes above the center of the kidney, particularly the right. The effect, therefore, of adduction of the lower ribs by the internal mechanical influences above mentioned is to bring pressure on the upper portion of the kidney and thus depress it. In men the before-described plane usually passes below the center of the kidney, so that constriction at this level tends to elevate or compress the kidney.

The truth of the above statements is well exemplified by the statistics of Küstner. He found that, of 295 cases of traumatic subcutaneous rupture of the kidney, 92 per cent. were in men and only 8 per cent. in women, while of 84 cases of "movable" kidney the percentages were almost reversed—namely, 94 per cent. in women and only 6 per cent. in men.

By external mechanical influences are meant injuries, such as falls, sudden jolts of the body, or blows about the region of the kidney. That an injury may directly produce a movable kidney is certain. Harris has seen a movable kidney in a man produced by his being thrown from a runaway carriage, and a case in a woman produced by a fall on the buttocks. Cases, however, that are directly and solely attributable to a single injury are not common. Usually the injury but directs attention or aggravates somewhat a kidney already more or less movable.

The principal reason why the right kidney is so much more frequently movable than the left is, unquestionably, the presence of the liver on the right side. This organ forms a firm, resisting body which transmits all force from above directly to the kidney, and prevents it from moving in any direction except downward and forward. The left kidney is not only somewhat more firmly fixed in its location, but has above it only the small spleen and the soft, yielding stomach.

What has brought about the body form of the female, which is so favorable to the occurrence of movable kidney? The broader hips, of course, are a sex peculiarity. The narrow contracted waist, however, is an acquired condition produced by artificial constriction which has been operative for innumerable generations. This constriction is due not alone to the corset, but to the tight skirt bands as well, and the latter are often more harmful than the former, as is shown by the fact that movable kidney is not uncommon in laboring women who have never worn corsets, but who constantly constrict their waists with tight skirt bands. According to Thomson, however, Trekaki, of Alexandria, finds that 42 per cent. of Arab women, who wear no corset, girdle, or constriction of any kind, have a freely movable kidney.

There are other conditions that are considered by some authors as instrumental in the production of movable kidney. Foremost among these may be mentioned pregnancy. That the influence of pregnancy has been greatly overestimated is apparent when we learn that from 30 to 50 per cent. of the cases occur in the unmarried, or in those who have never borne children. In 188 cases seen and collected by Harris 89 were married, 83 were single, and in 6 the condition was not stated. Of the married 4 are stated never to have borne children. Comby mentions 18 cases in children. Two were aged respectively one and three months, 6 were between one and ten years, and 10 were over ten years of age. The same argument is applicable against the statement that laceration of the perineum, with prolapse and displacement of the uterus, is a material factor in the causation of movable kidney.

The relaxation of the anterior abdominal wall and diminished intraabdominal tension following the removal of large abdominal tumors and fluid accumulations are supposed to favor the occurrence of movable kidney, but in large scrotal herniæ in men and in umbilical herniæ in women, where the intraabdominal pressure is often very much reduced, movable kidney is not common. Absorption of the perirenal fat, as occurs in wasting diseases, has been emphasized particularly by Landau as an etiological factor. As it is inconsistent with the two fundamental facts stated above, its influence must be considered slight. The course of the ureters through the pelvis is too much of a curve and too much "slack" is present, as shown by the possibility of ureteroureteral anastomosis, for the kidneys to be materially influenced by displacements of the uterus and tubal disease drawing on the ureters.

The causes of movable kidney, then, may be summarized thus: The principal predisposing cause is the body form; principal determining cause repeated internal and external mechanical influences as defined above. Of the minor influences may be mentioned general relaxation of the abdominal walls and kidney attachments following distention, wasting diseases, or enervating conditions.

In the light of Longyear's demonstrations and of Glenard's teachings it must be recognized that antecedent coloptosis is a causative factor that must always be taken into consideration.

Classification.—Three degrees of mobility may be described: (1) that in which the major portion of the kidney is palpable; (2) that in which the kidney descends so low that the hands may be brought together above it; (3) that in which the range of motion is so great that the kidney may descend to the brim of the pelvis, move forward to the anterior abdominal wall, or be moved inward beyond the middle line. In the first and second degrees the kidney moves up and down in the connective tissue space formed anteriorly by the prerenal and posteriorly by the retrorenal fascia. The perirenal fat, which varies much in quantity, moves mostly with the kidney. As the renal fascia passes between the adrenal and the kidney the former remains fixed and does not move with the latter. In the third degree the perirenal fat is often much less in amount, and may almost entirely disappear. As the kidney moves anteriorly it carries with it the prerenal fascia and the peritoneum, so that these structures gradually surround the kidney more and more, forming with the vessels and ureter at the hilum a pedicle or, as it is sometimes called, a mesonephron. The peritoneum is not firmly attached to the kidney, as in normal intraperitoneal organs, but loosely fixed thereto, being separated from it by the prerenal fascia and subperitoneal tissue. The renal vessels are often considerably lengthened. Legueu describes vessels that were 11 and 13 centimeters long. The kidney moves through an arc of a circle of which the vessels form the radius and their point of origin the center. The range of motion is, therefore, limited by the length of the vessels.

The large majority of movable kidneys belong to the first and second degrees. Those in which a so-called mesonephron is present are quite rare. At times the kidney, instead of moving up and down in a longitudinal direction, has its superior pole tilted forward, the organ moving in an anteroposterior direction, and approaching the surface just below the edge of the liver between this and the transverse colon. Again, the kidney may turn about an anteroposterior axis so that the hilum looks upward, and the superior pole may even occupy a lower level than the inferior.

Symptoms and Diagnosis.—Pain is the essential symptom of displacement of the kidney. Its autonomic manifestation is rather constant over the muscles of the renal zone in the affected side. It is, however, frequently associated with pain in the right lower quadrant, and is consequently sometimes mistaken for appendicitis. In certain other cases the associated pain is in the neighborhood of the pylorus. The pain is rarely, if ever, constant, but is usually brought on by standing, walking, or straining, as in heavy lifting.

In many instances, after an interval of freedom from pain, a beginning discomfort in the region of the affected kidney will increase, sometimes rapidly, in severity until it becomes intolerable and requires an anesthetic for its relief. Pain is at first described as "dull and aching," then as "colicky," then as "sharp and cutting." The patient can find no comfortable position. The slightest movement of the quadratus, or the latissimus dorsi, or of the rectus spinal muscles, causes intolerable intensification of the agony. The slightest touch is resented and will cause the patient to cry out with increasing suffering. Suddenly the pain will be relieved, followed shortly by a copious discharge of urine. These attacks are known as Dietl's crises, and are caused by mechanical obstruction of the ureters by the kinking of the canal incident to the displacement. They are preceded by and associated with a diminished discharge of urine, which accumulates in either the ureter, above the point of angulation (hydroureter), or in the kidney (hydronephrosis), or both, and is the cause of the pain. Mechanical obstruction of the blood vessels must also be taken into account as a factor in these crises. Constipation due to the generally associated condition of coloptosis is a very constant symptom.

Of the urinary symptoms frequent urination is the most common.

It is most marked when standing, and usually disappears at night or when lying down. The desire to urinate frequently may be periodic. Harris had a case of a woman with a movable right kidney who, at irregular intervals, would have severe attacks of painful, frequent urination lasting several hours. She was permanently relieved by fixing the kidney.

Gastric symptoms are among the most common with which these patients are affected. They are the usual symptoms noted in gastric dilatation and chronic gastritis, such as pain and distress after eating, eructations, nausea, and, at times, vomiting. There is tenderness on pressure in the epigastric region, and the abdominal aorta pulsates so markedly at times that one may be led to suspect an aneurysm. Fütterer calls attention to a bruit sometimes heard over the renal artery, which he considers due to a partial kinking of that vessel. Rarely jaundice has been noted, caused probably by the kidney drawing on the hepaticoduodenal ligament. Constipation is the rule and flatulence common. In connection with the nervous system we find dizziness very common, headaches, frontal or occipital, and, at times, all the vague nervous disturbances of hysteria and neurasthenia. Sometimes the mental state is one of depression or despondency, amounting almost to melancholia.

Many of the foregoing symptoms will be found aggravated during menstruation, and the kidney at this time is usually somewhat larger and more tender to pressure. It is not to be expected that all these symptoms will be present in any one case, but the cases may usually be grouped according to the prominence of particular symptoms. We thus find that in some cases the symptoms are referred principally to the urinary organs, in others to the gastrointestinal tract, and that in yet a third group the nervous symptoms are the most prominent. It should also be remembered that movable kidney is frequently found associated with other conditions, such as lacerations of the pelvic floor, uterine displacements, tubal and ovarian diseases, chronic appendicitis, gastric disturbances due to other causes, visceral ptosis, anemia, etc., so that in individual cases judicious discrimination is often necessary in assigning to each condition its proper influence in determining the symptoms present. Owing to the relations of the right kidney to the duodenum and bile tracts gastric symptoms are usually more pronounced when the right kidney is involved than when the left alone is movable. The diagnosis of movable kidney must always rest on the findings of a physical examination.

Headaches, high arterial tension, sleeplessness, nervousness, mental depression, and the whole picture of neurasthenia are often present in cases of long standing.

Dyspepsia and intestinal indigestion are frequent complaints in these cases.

Physical examination may or may not reveal a palpable kidney. Distressing cases of inward or lateral displacement of the kidney, associated with Dietl's crises, may exist without the kidney being palpable by external manipulation. This is due to the fact that, while there may be no descent of the kidney, Gerota's capsule may permit it to be displaced toward the median line. The patient should, however, always be carefully examined physically, and, if necessary, under an anesthetic.

99. PROCEDURE FOR THE MANUAL EXAMINATION OF THE KIDNEY

(1) Place the patient on her back on a table with her shoulders slightly elevated, her legs well flexed, and her hands under her head.

(2) With the warmed palm of the hand gently palpate both sides of the abdomen and both ileocostal intervals, noting any tumefactions or muscular rigidities.

(3) (a) Press the tips of the fingers of one hand just below the twelfth rib and just in front of the quadratus lumborum muscle; (b) the fingers of the other hand are pressed against the back just below the margin of the last rib; (c) the patient takes a full breath, then completely empties the lungs; (d) as she does so the pressure by both hands is gently but firmly increased, noting the presence or absence of the kidney between them.

(4) (a) Turn the patient in Sims' position with the affected side up. (b) Grasp the affected side with the fingers along the margin of the twelfth rib, and the thumb pressing deeply just below the end of the same rib. (c) Place the finger of the other hand on the abdominal wall just above Poupart's ligament. (d) Instruct the patient to fill and empty her lungs, or to cough. (e) Take advantage of the respiratory excursion to feel the kidney.

(5) (a) Place the patient in the knee-chest position; (b) repeat the manipulation just described.

Medical Treatment of Displacements of the Kidney.—Medical treatment is synonymous with palliative treatment of displacements of the kidney. It embraces hygienic, mechanical, and medicinal measures.

The hygienic management of nephroptosis consists in avoiding all conditions calculated to aggravate the condition. Constipation should, if possible, be overcome or even mitigated by dietetic measures, but, as this complication is generally dependent upon a coexistent displacement of the intestines, a laxative diet may not be of much avail. All straining, whether by prolonged standing, walking, lifting, or by being jarred, should be avoided.

Medicinal treatment is, of course, of no avail in actually curing displacement of the kidney. An occasional laxative is necessary to relieve the constipation of these cases, but the habitual use of this class of remedies is highly deleterious. A better practice is to give some of the heavy petroleum fats. I have for some time used a formula given me by Turck, combining Irish moss jelly, 75 per cent., white vaselin. 25 per cent., flavored to suit the taste. This preparation can be fed to prejudiced patients almost indefinitely without having them suspect that they are taking anything but the Irish moss, with the sugar and cream accompanying it.

Salol may be given as an intestinal antiseptic; also sulphocarbolate of zinc, menthol, or eucalyptol in moderate doses. The salicylates generally prostrate stomach digestion.

Mechanical Treatment of Displacements of the Kidney.—The mechanical treatment of nephroptosis consists in applying supports to prevent traction upon the already displaced organ. Fat subjects, or those with relaxed abdominal walls, generally require some sort of support. I have made many such cases comfortable to the degree of stopping the Dietl crises or even minor discomforts, and thus avoiding the necessity of an operation, by a properly adjusted abdominal supporter. The devices ordinarily found in the shops are but rarely of value in these cases. Each case has its individual requirements, growing out of the size, shape, and degree of relaxation of the abdominal wall, and the degree of associated splanchnoptosis. A general form of support cannot, therefore, be even suggested. A special support should be prescribed to meet the requirements of each case. The following principles should, however, obtain in every instance, viz.: (1) The support should exercise its uplift exclusively on the lower zone of the abdomen; (2) it should not interfere with free respiratory activity; (3) abdominal constriction at the waist line is to be avoided; and (4) external traction on the lumbar region is calculated to aggravate the condition. It is needless to add that this form of treatment is not eligible in the majority of cases.

Surgical Treatment of Displacements of the Kidney.—Various procedures have been devised for the surgical replacement of the kidney and for its retention when replaced. The earlier efforts to accomplish these results were generally failures, because the efforts to secure anchorage were not well conceived. There was generally no effort to clean the fat out of the renal fossa, and thus secure union of the organ to Gerota's capsule. Edebohls devised the plan of splitting or rather removing a portion of the fibrous capsule, thus bringing the organ directly in contact with the surrounding cellular tissue, and holding it in position by a series of interrupted sutures. Some operators have transfixed the organ with sutures passed directly through its parenchyma. Others have held it by two or more sling sutures passed entirely around either pole of the kidney and out through the posterior abdominal wall.

All these decapsulation and fixation operations failed to take into account what, as the result of Longyear's work, we now know to be the essential factors of the condition, and the essential means by which the normal relations of the kidney may be restored and maintained, viz., by the anchorage of the nephrocolic ligament. This is an operation that I had been doing for years before Longyear pointed out the exact significance of this ligament. My operation is as follows:

100. PROCEDURE FOR EXTRACAPSULAR FIXATION OF THE DISPLACED KIDNEY

(1) The patient is placed in the classical position on the well side with a firm pad, preferably pneumatic, under the same side. The equally classic incision about 1 cm. below the costal margin and about 10 cm. in extent is made obliquely downward and forward. This dissection is carried through the wall by cutting, with the exception that, to the extent that may be found practicable in each individual case, the obliquus externus, the obliquus internus, and the transversus abdominis muscles are separated and drawn apart by the finger rather than divided by the knife. In this way the capsula adiposa of the kidney is reached.

(2) The capsula adiposa is a most important structure in my procedure, and the very first point that I wish to emphasize is that extreme care must be taken to separate it from its relations to the abdominal wall, to the extent that such relations may have survived the displacement. Care must be taken not to separate the capsula adiposa at this juncture from the tunica fibrosa.

(3) The kidney, with its capsula adiposa attached to it, is then lifted to the surface. In carrying out this manipulation it may be and generally is necessary first to deliver the upper pole of the organ through the operation wound, for reasons that I shall later explain.

(4) The next step in the operation consists in wiping away the globular fat, much or little, from the connective tissue stroma of the capsula adiposa. This stroma, comprising the nephrocolic ligament, will be found arranged in very distinct and essentially parallel striæ extending obliquely downward and forward from the lower pole of the kidney. The manipulation of wiping the fat from its meshes is best

carried out by the use of gauze, care being taken not to separate these striæ from their attachment to the tunica fibrosa.

(5) Gauze is now likewise employed to apply vigorous friction to the tunica fibrosa in its upper zone, where the capsula adiposa but rarely invests it; but if it does the fat should be wiped away, if possible, without disturbing the attachments of its basic connective tissue striæ. This friction to the tunica fibrosa should be continued until the upper zone shows small punctate hemorrhages over its entire area.

(6) The kidney is now left for a few moments while any remnant of the capsula adiposa that may have been left adherent to the abdominal wall is entirely wiped away with gauze.

(7) A nest—*nidus renalis*—free from fat having thus been secured, the kidney is slipped back as nearly *in situ naturalis* as it will go without force.

(8) The connective tissue striæ of the capsula adiposa are then divided transversely at a distance of from 1 cm. to 2 cm. from the lower pole of the kidney. The stump thus formed on the renal side is stitched by chromicized catgut to the inner surface of the upper margin of the operation wound, while the lower stump is similarly attached to the inner surface of the lower margin of the operation wound.

(9) The operation wound itself is then entirely closed by laminated sutures. Drainage, being unnecessary, is, of course, not employed.

The results, primary and ultimate, that I have realized from this procedure have been uniformly satisfactory. I see no reason why the operation should ever be followed either by death or recurrence.

Longyear's procedure is based upon the principle of the Bacini operation for hernia, by which the cord is transplanted above the fascia.

101. LONGYEAR PROCEDURE FOR ANCHORAGE OF THE DISPLACED KIDNEY

(1) An incision 6 cm. in length is made from the lower margin of the twelfth rib and the outer margin of the quadratus lumborum muscle, diagonally outward toward the crest of the ilium.

(2) Blunt dissection is used through the latissimus dorsi muscle and the transversalis fascia, which is seized with two Kocher forceps and incised between, or the fascia may be entered by plunging and opening hemostatic forceps.

(3) The subperitoneal fat is pushed away when Gerota's capsule appears in the upper angle of the wound as a pinkish-colored membrane, is seized with two forceps, and cut between.

(4) The index finger of one hand, introduced into Gerota's capsule and carried to the lower pole of the kidney, acts as a guide for

the long Kocher forceps, with which the tissue about an inch below the kidney and containing the nephrocolic ligament is seized and brought up. It may be necessary first to draw up the kidney before the ligament can be reached.

(5) The mass of tissue containing the nephrocolic ligament is brought out through the operation wound, and the ligament itself is isolated by sponge dissection, after which it is separated from its underlying connections by means of a hook forceps, by which it is now held in the form of a loop.

(6) The cut margins of Gerota's capsule are now brought together under the loop of the ligament and secured by a mattress suture of catgut. This is fortified by another similar mattress suture passed in the opposite direction. Gerota's capsule is then closed by interrupted sutures above and below the loop.

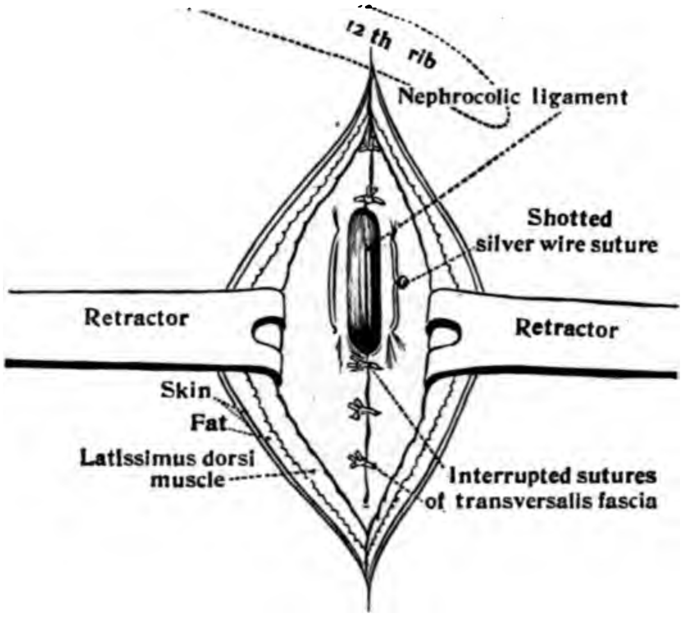

12 th rib
Nephrocolic ligament
Shotted silver wire suture
Retractor
Retractor
Skin
Fat
Latissimus dorsi muscle
Interrupted sutures of transversalis fascia

Fig. 241.—(101) Longyear Procedure for Anchorage of the Displaced Kidney.

(7) A mattress suture of silver wire is now passed through either lip of the fascia, which is thereby approximated under the loop, the ends of the suture being secured by a shot, and the ends of the wire cut flush with the shot.

(8) Further closure of the transversalis fascia is made with interrupted catgut suture, leaving the loop of the nephrocolic ligament outside both Gerota's capsule and the superficial fascia (Fig. 241).

I have not modified my technique to accord with the newer procedure of Longyears, first, probably because my results have been entirely satisfactory, and, second, because I look upon the systematic removal of the perinephric fat from within Gerota's capsule and the friction to the fibrous capsule as important features of the procedure. The extrafascial loop of the nephrocolic ligament, fortified with the silver wire, would seem to make a firm anchorage.

102. EDEBOHLS PROCEDURE FOR FIXATION OF THE KIDNEY BY DECAPSULATION

(1) The kidney is exposed by oblique incision along the margin of the twelfth rib and brought up into the field of operation.

(2) The fatty capsule is carefully removed from the capsula propria by blunt dissection.

(3) The capsula propria is split longitudinally on the dorsum from one end of the kidney to the other and peeled back.

(4) The kidney substance thus exposed is transfixed at either pole with wire or silkworm gut.

(5) The denuded kidney is now returned to its normal position.

(6) The ends of the transfixion sutures are brought out through the posterior abdominal wall.

(7) The external incision is now closed.

There are various modifications of this procedure. Some operators simply denude the posterior half of the kidney and hold it in position by sutures passed through the true capsule of the other half and thence into or through the posterior wall. Others swing the kidney by a hammock suture. The essential principle in all instances is, however, the same, viz., to implant the kidney substance proper directly into the surrounding cellular tissue.

With respect to these two principles of operation I may state that I have been induced to evolve and practice extracapsular fixation of the kidney, because (1) it is surgically feasible, (2) it is effective primarily, (3) it is generally and, indeed, as far as my experience goes, always practicable, and (4) it comes nearer than any other procedure to restoring the pathologically movable kidney to its normal anatomic relations and to the exercise of its normal physiologic functions. I urge it as the operation of choice, because (5) decapsulation is liable to induce and frequently does induce wholly unnecessary adhesions, atrophies, and other pathologic changes, resulting either in its loss or in the invalidism of either the kidney or the patient, or both; (6) transfixion sutures in the parenchyma may and often do induce similarly disastrous consequences; (7) treatment of the surface of the kidney by irritating substances induces adhesions and tissue changes that are pathologic in character; and, (8) in consequence of the greater liability to hemorrhage and infection following all invasions of the true capsule and the parenchyma of the kidney, and for other obvious reasons, these procedures are more liable than extracapsular fixation to be followed by primary complications and final failure.

CHAPTER VI

DISPLACEMENTS OF THE RECTUM

Displacements of the rectum in women involve:

(a) The anterior wall—anterior rectocele.
(b) The posterior wall—posterior rectocele.
(c) The descent of the whole bowel—prolapse.
(d) The ascent of the whole bowel.

Displacements of the anterior wall of the rectum have been considered elsewhere (see Anterior Rectocele under Displacements of the Vagina).

DISPLACEMENTS OF THE POSTERIOR WALL OF THE RECTUM OR POSTERIOR RECTOCELE

Posterior rectocele consists of backward sacculation of the posterior wall. This condition, which is not frequently recognized, is, nevertheless, one of relatively common occurrence.

Its symptoms consist of more or less rectal tenesmus and difficulty in defecation, there being a constant sense of the presence of residual feces after an effort at dejection. If the bowel is loaded with hardened fecal matter much difficulty is experienced in discharging it, the effort being attended with a feeling of retroanal protrusion. If a patient afflicted with this condition is placed in either the dorsal or the semiprone position, and is asked to strain, a fullness behind the anus will be apparent. Rectal exploration by the finger (Fig. 242) will reveal a posterior sacculation of the rectum, just within the external sphincter, and associated with a diminution or a disappearance of the normal constriction due to the proper action of the levator ani muscle.

The *pathology* of this condition is essentially that of the dilatation of the rectum above the sphincter ani muscle, and is due to either a relaxation or an injury of the deep muscular layer of the pelvic floor. The external sphincter fails to act properly because the descending fecal matter is, to a certain extent, diverted from its course, and consequently fails to exercise the proper dilating influence upon the external muscle.

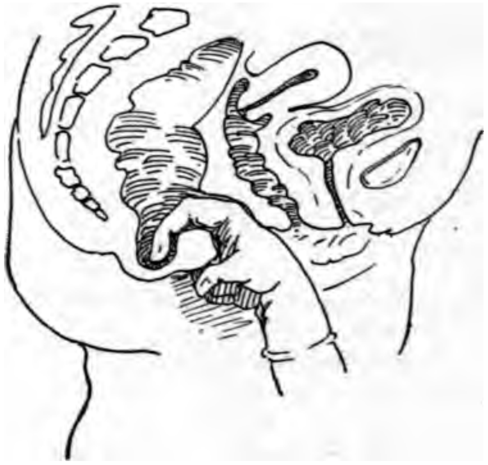


FIG. 242.—POSTERIOR DISPLACEMENT OF THE RECTUM (POSTERIOR RECTOCELE) DEMONSTRATED WITH THE FINGER INTRODUCED INTO THE RECTUM.

The *treatment* consists (1) in restoring the integrity of the parts upon the damage to which the rectal displacement depends, and (2) in restoring the rectum itself to its normal position.

103. PROCEDURE FOR POSTERIOR RECTOCELE

I have used the following procedure in these cases with success:

(1) With the patient on the back, the thighs thoroughly flexed, an incision is made from about 1 cm. posterior to the anal margin to the tip of the coccyx, care being taken to avoid the sphincter ani muscle.

(2) The anococcygeal ligament, which is split by this incision, is pushed to either side, when the rectal wall is exposed.

(3) With one finger in the rectum to act as a guide the posterior wall of the rectum is dissected away from its connective tissue to a point above the levator ani muscle.

(4) The sacculated bowel is then lifted above the levator ani muscle and secured in that position by interrupted sutures of catgut.

(5) The levator ani muscle and the split anococcygeal ligament are then drawn together from either side by interrupted catgut sutures and the outer layer closed. The same thing can be accomplished by figure-of-eight silkworm gut sutures.

PROLAPSUS OF THE RECTUM

When the levator ani has once been damaged, and the rectum has been deprived of its support, there occurs more or less descent or prolapsus of the bowel. This descent is augmented by an effort to defecate.

Lifting, carrying loads, or shoving will increase the descensus. The prolapsus may be partial or complete. When complete the condition is generally associated with redundancy of the bowel. In long standing cases the mucosa and muscularis both become atrophied with consequent loss of bone to the walls of the rectum.

104. VAN BUREN PROCEDURE FOR PROLAPSUS OF THE RECTUM

(1) Place the patient in the knee-elbow or knee-chest position.

(2) Reduce the prolapsus.

(3) Burn a longitudinal eschar down through the mucosa to the connective tissue extending from the mucocutaneous juncture 3 or 4 cm. upward.

(4) Repeat this with a parallel eschar at intervals of about 105 cm. around the circumference of the bowel.

104a. LANGE PROCEDURE FOR PROLAPSUS OF THE RECTUM

(1) Place the patient in the knee-chest position.

(2) Incise the posterior wall of the rectum from the lower part of the sacrum to the anus.

(3) Remove the coccyx.

(4) Pass catgut sutures longitudinally near the mediary line and through the muscularis, only thus unfolding the posterior wall of the rectum.

(5) A second turn of catgut sutures is now inserted still farther to enfold the wall of the rectum.

(6) The levator and sphincter ani muscles are sutured together and the wound closed. A tube is left in the rectum.

CHAPTER VII

DISPLACEMENTS OF THE INTESTINES

VAGINAL ENTEROCELE

Fargas has called attention to the condition of vaginal enterocele, or vaginal hernia, in which the small intestines are prolapsed (enteroptosis) into the cul-de-sac, producing sacculation or hernia of the upper and posterior vaginal wall (Fig. 243).

The symptoms are intimately associated with those of enteroptosis, viz., dragging pain in the back, acute colicky attacks, obstipation. Occasionally, although rarely, prolapse of the uterus occurs as an associated condition, when, of course, the symptoms due to that condition are to be taken into account. On examination a soft, pultaceous, crepitant protrusion is felt in the upper zone of the vagina just back of the cervix. It attains its maximum when the patient is standing, and when she coughs or strains in that position, and will disappear if the patient is put in either the knee-chest or the Trendelenburg position.

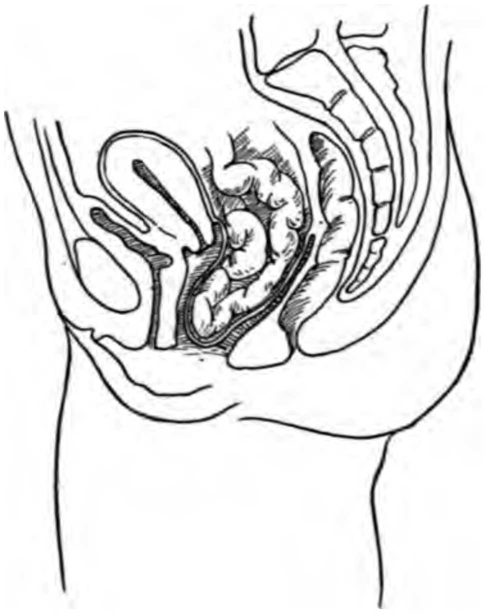


FIG. 243.—VAGINAL ENTEROCELE IN WHICH THE HERNIAL POUCH IS FORMED FROM THE UPPER AND POSTERIOR VAGINAL WALL. (After Fargas.)

Treatment.—*Medical treatment* is only palliative, and cannot be relied upon for more than temporary relief, especially in the presence of an acute attack of pain. These attacks are generally due to obstruction resulting from the enteroptosis, and but rarely to either the constriction exercised by uterosacral ligaments or to the impaction of the intestines into the hernial sac. These attacks are generally relieved by placing the patient in either the knee-chest or the Trendelenburg position. Laxatives may be required to relieve an acute obstipation, but they should under no circumstances be habitually given, as they tend to produce atrophic and consequently irreparable changes in the walls of the intestines. High enemas, given with the patient in either of the positions indicated, may be advantageous. Opiates should be strenuously avoided.

Surgical treatment is obviously the only curative means for a condition the very nature of which makes it progressive in the absence of such treatment. This, to be effective, must be addressed (a) primarily to the cure of the enteroptosis, and (b) secondarily to the obliteration of the cul-de-sac of Douglas.

The surgical treatment of enteroptosis, which I find not only practicable but safe and satisfactory, in a large number of cases does not fall within the limits of this work.

The surgical obliteration of the cul-de-sac of Douglas may be accomplished by either (a) the vaginal, (b) the abdominal, or (c) by the abdominovaginal routes.

105. PROCEDURE FOR OBLITERATION OF THE CUL-DE-SAC OF DOUGLAS

(1) Open the cul-de-sac by my procedure of superior colporrhaphy (Figs. 235, 236, 237).

(2) (a) The margin of the peritoneum in the bottom of the cul-de-sac may be isolated, seized with forceps, and dissected up by the finger hooded with gauze. (b) Or, if separation of the peritoneum is not found readily practicable, it may be obliterated by stitch pressure in accordance with Coffey's law. (q. v.).

(3) Whether denuded of peritoneum or not, the cul-de-sac should be obliterated by a succession of combined interrupted sutures, care being taken to have them drawn tightly, so that the endothelium will be destroyed by pressure. This is especially important if denudation has not been found practicable.

Great care must be taken in this procedure to avoid either wounding the rectum or penetrating it with a suture.

106. HARTMANN PROCEDURE FOR THE OBLITERATION OF THE CUL-DE-SAC OF DOUGLAS BY THE ABDOMINAL ROUTE

(1) The patient is placed in the Trendelenburg position and the abdomen freely opened in the median line.

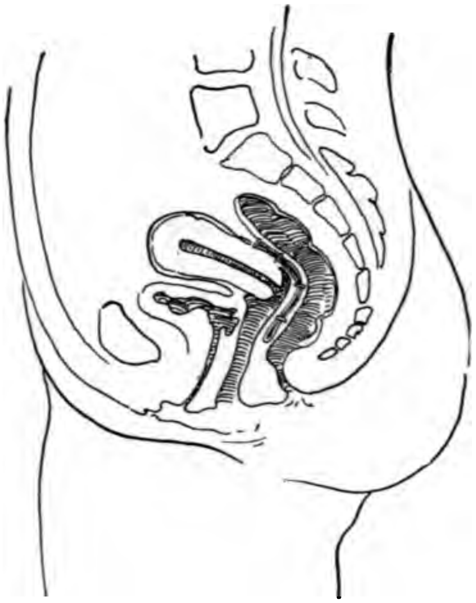


Fig. 244.—(106) Procedure for Vaginal Enterocele by Obliteration of the Cul-de-sac of Douglas. (a) Location of obliterating sutures. (After Hartmann.)

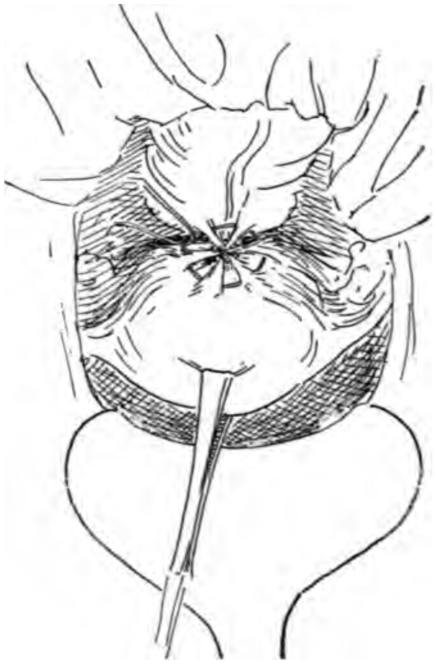


Fig. 245.—(106) Procedure for Vaginal Enterocele by Obliteration of the Cul-de-sac of Douglas. (b) Insertion of the upper purse-string suture. (After Hartmann.)

(2) The fundus of the uterus is seized with traction forceps and drawn well up.

(3) With a sharply curved needle the peritoneal pouch is encircled as near its bottom as possible with a slowly absorbing suture, which is then tied.

(4) A second, third, and even fourth suture are similarly passed and tied (Fig. 244).

(5) The final suture is a purse-string, which embraces the margins of the uterosacral ligaments, the posterior uterine wall, and the serous layer of the rectum (Fig. 245).

The abdominovaginal method of operation is by a combination of the two procedures just described.

SECTION IV

FOREIGN BODIES, INCLUDING CALCULI

Foreign bodies are found in (a) the vagina, (b) the uterus, (c) the urethra, (d) the bladder, (e) the ureters, (f) the kidneys, and (g) the peritoneal cavity.

Foreign bodies, found in these localities, may be divided into (a) exotic and (b) indigenous, or those which are introduced from without and those which are developed within the organs or structures themselves.

The first, or the exotic class, embraces a large variety of objects that are introduced from the outside, such as hair-pins, pencils, pen-holders, fragments of catheters and bougies, pessaries, tents, cotton, cotton gauze, sponges and surgical instruments.

The second, or indigenous class, is restricted to the various forms of calculi that develop, more particularly, in the urinary tract.

CHAPTER I

FOREIGN BODIES FOUND IN THE VAGINA

Foreign bodies found in the vagina are practically always introduced from without, about the period of puberty, when erotic impulses are first beginning to assert themselves, and before they are brought under control. Girls are very liable to explore the vagina with their fingers, and sometimes with foreign substances. I have been called upon in one case to remove a piece of slate pencil, and in another, a hair-pin that had been thus lost in the vagina. In mature subjects, the foreign bodies most frequently found in the vagina are pessaries. This is especially true of the peasant class that come to this country from Europe, where the manufacture and application of pessaries is a kind of neighborhood function performed by certain midwives or other kindly women. These formidable instruments are generally of the ring pattern, and are made by carefully winding one layer after another of carefully waxed cotton yarn or flax. This is then inserted in the vagina to prevent extrusion of the uterus—a condition very prevalent among the women of this class, who, in their native countries, occupy a position that makes them the real burden bearers of the family. I have removed one of these pessaries after it had been in position for over eighteen years, during which time it had ulcerated through the wall of the vagina, beneath which it had become in part imbedded.

Symptoms and Diagnosis.—In young girls, the introduction of a foreign body into the vagina is generally at once followed by pain which leads to confession of the patient, exploration of the parts, and to detection of the offending object. In other instances, such as that of a neglected tampon or a pessary, the occurrence of a persistent and foul-smelling discharge attracts attention to the condition. Physical examination then reveals the nature of the case. The history of the case cannot always be relied upon. In the old German peasant, from whom I removed the eighteen-year-old pessary, the circumstance of its introduction had been forgotten for several years, and the patient required assistance to bring it to mind.

Treatment.—The treatment is obviously by removal of the foreign body. This may have to be done under an anesthetic. Where deep injury has been done to the vaginal wall, daily cleansings will be necessary during the course of healing. In certain cases, it will be necessary to apply an obturator to prevent the development of cicatricial stenosis.

CHAPTER II

FOREIGN BODIES IN THE UTERUS

Foreign bodies, or their nuclei, found in the uterus always belong to the second class, namely, objects introduced from without, most generally in an attempt at criminal abortion. In certain cases, however, the objects are legitimately introduced in the course of professional treatment.

They may consist of pledgets of cotton or of gauze left by accident in the uterine cavity in the course of treatment, the broken end of a uterine electrode, or the stem of an intrauterine pessary. Schauta reported a case in which a hard-rubber pessary, 2.5 inches in long diameter, inserted into the vagina, had escaped into the uterine cavity from which it was delivered with extreme difficulty by *morcellement*. Neugebauer, in his collected series of 297 cases of pessaries, neglected and incarcerated in the vagina or escaped into adjacent parts, notes six in which a vaginal pessary slipped into the uterus. Bodies usually found in the uterine cavity are hairpins or broken-off ends of instruments employed for the most part by patients themselves in an effort to produce abortion.

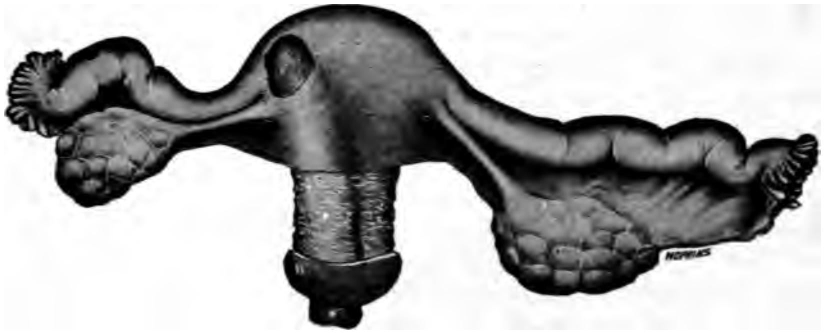


Fig. 246.—Ashton's Case of a Tent Acting as a Foreign Body and Perforating the Anterior Wall of the Uterus.

W. E. Ashton reports (*Medical Bulletin*) an interesting case in which as the result of an attempt to forcibly insert a tupelo tent, a false passage was made from the internal os through the anterior uterine wall to a point above the uterovesical fold where the tip of the tent protruded into the peritoneal cavity. Laminaria and other tents introduced into the cervical canal have escaped into the uterine cavity proper. Mittermaier reports a case in which a loosely tied silk ligature had become the nucleus of an infection and of a foreign body following an operation for fibroid, and another case in which the glass catheter used for irrigating the uterine cavity had broken *in situ,* the fragments having become so thoroughly embedded that all attempts to remove them had proved futile.

Symptoms and Diagnosis.—The diagnosis of some of these cases in the absence of a definite history can be made only by forcible dilatation of the cervix, and either instrumental or digital exploration of the uterine cavity. In some instances the X-ray will assist greatly in the diagnosis.

Treatment.—The treatment consists in dilating the cervix and, if possible, removing the foreign body. This is sometimes a matter of extreme difficulty. Thus, Schauta, in his efforts to remove the long incarcerated pessary from the uterine cavity, perforated the latter repeatedly with a Pacquelin cautery for the purpose of getting some means of grasping the ovoid body. The removal of smaller foreign bodies can generally be effected by means of the curette, the Emmet curette forceps, or the Lawson Tait colpocystotomy forceps. In some cases, however, this will prove unavailing; thus, Mittermaier found it impossible by such means to remove the fragments of broken glass from the cavity of the uterus, to accomplish which he had to divide the uterus from the bladder, draw the fundus down into the vagina, and make an incision into the uterine cavity. Having removed the glass, he stitched up the incision, and returned the womb to its normal position. It is important to bear in mind in cases in which such an operation is necessary, that the operation should be made anteriorly, rather than posteriorly, to the cervix. When a foreign body results in injury and consequent infection, hysterectomy may be done, as Ashton did successfully in the case to which reference has just been made.

CHAPTER III

FOREIGN BODIES IN THE URETHRA

Foreign bodies, originating from without, are but rarely found in the urethra. It is true that many such bodies are introduced into the urethra, but they either go on into the bladder or drop out. Hair-pins, hat-pins, slate-pencils, pen-holders, lead-pencils and syringe nozzles, often employed for erotic purposes, are sometimes introduced into the urethra instead of the vagina. The bodies most frequently found in the urethra are calculi which either descend from further up the urinary tract or are formed in some sacculation or diverticulum of the urethra itself. Sometimes urethral calculi attain a very large size. In a case reported by Earp, about two inches of the lower portion of the calculus occupied the distended urethra and extended up into the bladder. The patient was a woman, 47 years old, who had suffered from bladder disturbance for about five years. For three years there was retention of urine, but it was impossible to pass a catheter on account of the obstruction. A physician was not notified of this fact. Finally the calculus, weighing 845½ grains, was passed spontaneously. The stone was three inches long, and its greatest diameter was 1⅛ inches.

Morton removed a stone that lay in a pouched urethra, distinctly more to one side of the middle line than the other. On cutting open the stone, a piece of wood was discovered as its nucleus. This wood had been introduced into the urethra twenty-seven years previously.

Symptoms and Diagnosis.—The most constant symptom is dysuria with persistent tenesmus. Occasionally blood is to be found in the urine. Exploration with the sound reveals a sensitive zone of the urethra with more or less obstruction. If a calculus is present, the metallic grating sound is elicited by contact with the exploring instrument. A urethroscope may reveal the offending body *in situ*. Digital exploration along the dorsum of the urethra may be sufficient to establish the diagnosis.

Treatment.—This consists in removing the foreign body, which can generally be done easily enough through the meatus urinarius. If a calculus has formed in a saccule of the urethra, it may be more conveniently removed by incision through the vaginal membrane.

CHAPTER IV

FOREIGN BODIES IN THE BLADDER

Foreign bodies in the bladder are naturally divisible into

(a) Objects introduced from without the bladder.

(b) Calculi or objects that form within the bladder.

Objects introduced from without generally reach the bladder through the urethra, although they may find their way in by process of suppuration from neighboring structures. Thus, ligatures from suppurating pedicles or sutures from infected wounds may find their way into the bladder and serve as nuclei for the development of calcareous accretions.

As already stated, however, the urethra is the most common route, and of 391 cases of foreign bodies in the bladder collected by Dénucé, 258 were introduced intentionally, that is, out of morbid curiosity, or for masturbating purposes. Among the various articles thus introduced may be mentioned hair-pins, glass-headed pins, beads, pieces of lead-pencils, slate-pencils, chewing-gum, straws, small paraffin candles, peas, kernels of corn, etc. Foreign bodies may likewise find their way into the bladder accidentally, as when the end of a catheter breaks off or a whole glass catheter slips in, as mentioned by Kelly, or a lithotrite or other instrument breaks while being manipulated within the organ. A foreign body may remain in the bladder a long time without inducing any special symptoms. Thus, Letulle mentions a case in which a pen-holder 8 centimeters long remained in the bladder three months without producing the slightest trouble, and Steinwitz, one where a broken-off rubber catheter remained seventeen years without giving rise to any considerable difficulty. Guiteras reports the case of a strip of banana peeling, and another of a nail within the bladder.

Symptoms and Diagnosis.—Painful contractions of the bladder may be induced, particularly if the body has sharp points, and perforation of the organ may occur with the development of a fatal peritonitis. Ordinarily, the symptoms are those of a simple cystitis; painful, frequent urination, with blood, pus, and decomposition of the urine. The decomposition of the urine leads to the deposition of phosphates about the foreign body as a nucleus, and thus are developed secondary stones.

While the pain is usually more severe after emptying the bladder or following exercise or jolting of the body, and while the amount of blood present in the urine is usually more pronounced than in ordinary cases of cystitis, still the symptoms are not absolutely characteristic of the presence of a foreign body, which fact must be demonstrated by bimanual palpation, the introduction of the sound, or inspection through the cystoscope. The Roentgen ray is a useful means of diagnosis. Often with the patient anesthetized, the stone or other foreign body, if large, can be felt by bimanual examination.

The treatment of vesical calculi may be considered as (a) medicinal and (b) surgical.

Medical Treatment.—The medicinal treatment consists of a regimen and remedies prescribed with the object of dissolving the concretions. Alkalies with an abundance of water have had great repute in this connection. Elsner has reported the case of a woman of 30, who in two years had 405 attacks of colic due to vesical calculi, passing 518 stones, of which 60 were large, 43 medium, and 415 were small. Bradshaw, in reporting his case of spontaneous fracture of vesical stones, recounts the explanations advanced by various authors regarding fragmentations, and considers that, in his case at any rate, the circumstances that combine to bring about disintegration are the maintenance of the urine in a healthy condition, the presence in that secretion of abundance of water, and the reduction to a minimum of the products of nitrogenous waste. He is strongly of the opinion that alkalies, as such, play but a very subsidiary part in the disintegration of calculi, and that the attempt to dissolve calculi by bathing them in alkaline urine is likely to defeat the object in view by leading to the formation on the stone of a layer of phosphates, a material which has no tendency to disintegrate spontaneously.

The springs of Montecatini, Italy; Vichy, France; Karlsbad, Germany; French Lick, Indiana; and Hot Springs, Arkansas, have great repute in this connection. Waters that contain infinitesimal quantities of lithia are valuable probably only because they are water and not because of their lithia content. Urotropin is supposed to have a salutary effect as an antiseptic to the urinary tract. The misfortune attending medical treatment in these cases is that they create a sense of security not justified by the possible results, until serious infections or other complications make surgical interference both imperative and dangerous.

Of course, when the foreign body is not a calculus, medicinal treatment undertaken for curative purposes would be simply as absurd as dangerous.

Surgical Treatment.—Surgical treatment consists in the removal of the foreign body, whatever it may be. A primary stone, if not too large, may be removed through the dilated urethra, or it may be crushed with the lithotrite and washed out with the evacuator. Much ingenuity must often be displayed in the removal of irregular stones, or those with sharp points. Much, however, may be done through the dilated urethra with the cystoscope and forceps, while the patient is in the knee-chest position and the bladder distended with air. In dilating the urethra, the external meatus should, if necessary, be incised laterally and in the middle line, and the dilatation, which should be made slowly with smooth dilators, should not exceed 18 to 20 millimeters, owing to the danger of producing permanent incontinence. The incisions of the meatus should subsequently be sutured. When the body cannot be removed through the dilated urethra, it will be necessary to incise the bladder either from the vagina or above the pubis. The suprapubic route is usually to be preferred, as it affords easy access to the bladder and there is no difficulty about closing the wound which heals by itself, if the urine is drained off with a self-retaining catheter.

CHAPTER V

FOREIGN BODIES IN THE URETERS

(*Ureteral Calculi*)

Now that the ureters are subject to catheterization, it is possible that instruments may break and fragments of them be left behind, although I have not read of such an accident. Practically all foreign bodies in the ureters are calculi of either renal or ureteral origin.

Only comparatively small calculi can find their way from the kidney into the ureter. They may become impacted in that canal at any point in its course, although the most frequent point of lodgment is at the vesical orifice. The other narrow points of the canal are very near the renal end and in the middle segment of the canal. The calculi are generally small, of an oval or oblong shape, although I have had two instances in which the stones were distinctly irregular. They generally vary from 4 to 6 millimeters in length, with about half that width. Larger ureteral stones have been observed, in one instance as large as a hen's egg. They are generally single, but are sometimes multiple. Cruveilhier observed a chain of stones extending from the bladder to the kidney. Chemically, they consist of uric acid, urates, phosphates and calcium oxylate in varying proportions.

This condition may occur at any period of life, although it is essentially a condition of thirty-five and beyond. Rafin has collected 39 cases of ureteral and renal lithiasis in children, two of them occurring in his own practice.

The question of urinary calculi in children requires additional discussion. Rafin, to whose thirty-nine collected cases of this sort I have already alluded, states that the symptomatology seems to be the same for children as for adults, but radioscopy is even more instructive with children. The knowledge that there are stones located at different points through the urinary apparatus is important, as the gravity of the condition is enhanced by the multiplicity of the localizations. Nephrotomy seems to be even less injurious in children than in adults. The immediate results were good in all the cases after the operation; the four fatalities were all in cases with severe infection and multiple concrements. The end-results are known in only very few of the children. It is more than probable, he thinks, that in many cases of urinary calculi in adults, the concrements had commenced to form in childhood, as in a case cited in which a stone, weighing 25 gm., was removed from the ureter of a girl of 16, who for ten years had had occasional kidney colics and hematuria. Five of the thirty-nine children were under 5, eighteen between 5 and 10, and twelve between 10 and 15. The lithiasis was exclusively on the right side in twenty-one cases and bilateral in six of the thirty-five in which the localization is mentioned; the concrements were in the right kidney alone in seven, right ureter alone in eleven, both kidney and ureter in two, while both were involved on both sides in three cases, and in another bilateral case the bladder was also involved, as also in another case exclusively on the right side. In one of Nicolich's cases, radioscopy showed a stone in the right kidney, three in the left, and five in the left ureter. The latter were spontaneously expelled and the kidney stones removed by operation, after which radioscopy showed the entire urinary apparatus clear of concretions. In conclusion Rafin reiterates the comparative harmlessness of operations on the urinary apparatus in children and the necessity of keeping watch over the little patients so as to institute medical measures to ensure a permanent cure of the infectious process; it is liable to persist in a latent form unless diligently sought and eradicated.

Symptoms and Diagnosis.—The symptoms are inconstant. In those cases in which a renal stone descends through the ureter, there is generally intense colicky pain during the period of transit which may last from a few hours to several days. In the so-called latent cases, those in which the stone gradually develops in the ureter without producing complete obstruction, there is more or less discomfort on the affected side, or on both sides, if both are affected. In these cases, the canal dilates and permits the urine to pass by the side of the calculus. There are frequent recrudescences of pain in these cases without the intense agony incident to complete impaction. When from any cause this condition occurs, there is anuria on the affected side; and if the condition is bilateral, which happens but rarely, the anuria is complete. The pain in these cases, when the obstruction is acute, is generally agonizing and is referred to the bladder, the sides corresponding to the course of the ureters and to the kidneys. Guiteras insists that it is not necessary for both ureters to become blocked to produce complete calculous anuria, but that the unilateral blocking of a ureter may cause surgical anuria, only when the other ureter is absent, or when its functionating power is either temporarily or permanently destroyed, thus doing away with the theory of reflex anuria. [illegible] [illegible] reports a case, age 35, in which urine was not voided for eight days, during which time there was no desire to urinate, no pain and not much disturbance in general health. The bladder was empty, the abdomen nowhere tender, the secretion of urine having evidently ceased for the time being. An incision over the left kidney revealed this organ much enlarged, suggesting that the other kidney had long been totally functionless, which proved to be the case. The trouble, according to Fraenkel, was evidently a reflex anuria from the irritation of calculi in the hilus; other calculi were expelled later from the ureter. The capsule was enormously distended, but when opened no urine was found in the hilus. Normal conditions in the circulation and epithelium were gradually restored, and the secretion of urine proceeded normally thereafter. An interesting feature of the case was the lack of general disturbances during the 8 days of total anuria, suggesting that the retention of waste matters is not after all the real source of the disturbances observed during uremia. In this case, measures to promote diaphoresis and to keep the bowels open during the week of anuria warded off evil consequences from the retention. The danger is when the kidney tissue becomes seriously impaired by the factors primarily responsible for the anuria—this injures the secretory apparatus beyond repair, and operative intervention should never be delayed until this danger stage is reached. This is a most important distinction and should always be remembered in connection with emergency treatment.

The acute painful cases to which I have alluded are not to be confused with those chronic cases, in which the condition has developed so gradually and so insidiously as to gradually, insidiously and painlessly dilate the ureter and kidney above the point of obstruction. In these cases, many of them not previously suspected, the sudden suppression of urine is a painless complication.

In these latter cases, careful manual exploration will reveal a much enlarged and distended kidney or kidneys; the bladder is found empty. If only one kidney is enlarged, the presumption is that the other kidney is functionally destroyed or in abeyance, while the ureter or the enlarged kidney is blocked. Further confirmation of this inference is had by catheterization of the ureters, and by X-ray examination of both organs. It should be stated here that X-ray examinations of the ureters are sometimes misleading in spite of the utmost precaution. The varying position of the canal and the fact that other deposits, notably phleboliths, in the neighborhood may cast similar shadows, must be kept in mind.

Treatment.—Medicinal treatment in cases of calculi in transit consists of so-called solvents, such as potassium acetate, sodium carbonate, lithium carbonate and other alkalies given in an abundance of water. Urotropin has been found to act well as an antiseptic for the urinary tract. Morphin, supplemented sometimes with an anesthetic, is required to control the pain. Long temporizing with medicines is not justifiable, as infections and other complications are liable to develop greatly to the hazard of the patient.

Surgical treatment consists in the removal of the calculus, one or more, from the ureter. The method of operation depends upon the location of the calculus as determined by the Roentgen ray.

107. NITZE PROCEDURE FOR EXPULSION OF THE URETERAL CALCULUS

(1) Pass a ureteral catheter up to the stone, employing a Nitze ureteral occlusion catheter for the purpose.

(2) As soon as the obstruction is encountered, distend the canal by inflating the soft rubber cap of the catheter.

(3) Maintain the distension long enough to permit the urine to escape around the calculus.

(4) Withdraw the catheter, with its tip still somewhat inflated, moving it slowly enough to permit the calculus to follow, propelled by the urine from the kidney.

(5) If the calculus again becomes engaged, repeat the manipulation.

Jahr reported success with this manipulation which may be employed in the anuria of either acute or latent cases.

108. PROCEDURE FOR URETEROSTOMY (URETERO-LITHOTOMY) BY THE EXTRAPERITONEAL ROUTE

(1) An incision is made down upon the ureter as nearly as possible over the point where the X-ray, or the ureteral catheter, or both, have demonstrated the obstruction to be located.

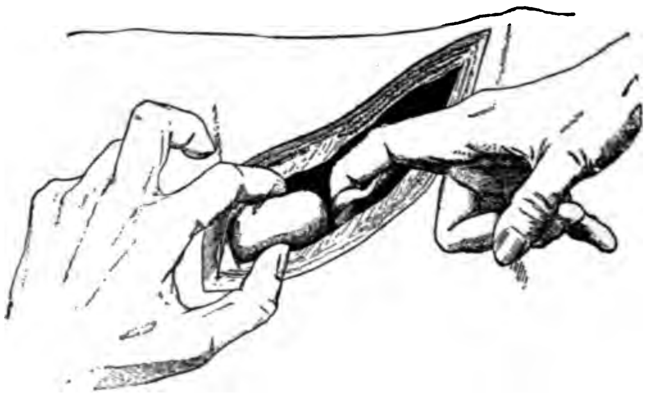


FIG. 247.—INCISION AND METHOD OF ISOLATING THE URETER IN URETEROSTOMY BY THE EXTRAPERITONEAL ROUTE. (After Pierre Duval, from Guiteras' "Urology.")

(2) The ureter is isolated with the tip of the index finger by which an exploration is made, more definitely to locate the calculus, care being taken to avoid unnecessary injury to the surrounding normal attachments of the ureter.

(3) The ureter is then temporarily ligated above the point of obstruction.

(4) When the obstruction has been located the ureter should be hooked up over the tip of the index finger, by which the point of obstruction is thus brought into the field of operation (Fig. 247).

(5) The ureter is opened by a longitudinal incision long enough to permit the free delivery of the calculus.

(6) The incision in the ureter is then closed by means of fine catgut or fine silk suture, either interrupted, but preferably by the continuous hemostatic stitch, by which approximation is best assured.

(7) The temporary ligature is then removed from the ureter, which is then dropped back, and the outside incision closed with either a silkworm gut, or a Kocher small glass drain.

109. PROCEDURE FOR URETEROSTOMY (URETERO-LITHOTOMY) BY THE TRANSPERITONEAL ROUTE

(1) With the patient in the Trendelenburg position, the abdomen is freely opened in the median line.

(2) The course of the ureter is explored with one hand, and the point of obstruction located.

(3) If the obstruction is located in the middle or lower portions of the canal, further manipulation will be greatly facilitated by retracting the intestines and holding them back by means of the gauze-roll.

(4) The peritoneum should be incised over the point of obstruction.

(5) Put a temporary catgut ligature around the ureter just above the obstruction.

(6) Isolate the obstructed portion of the ureter over the hooked point of the finger, or over a blunt hook, and draw it up only far enough to hold it steady.

(7) Incise the canal lengthwise far enough to permit the easy delivery of the calculus.

(8) If the case is clean, stitch up the incision with fine catgut or fine silk, either by interrupted or by continuous hemostatic suture.

(9) If the case is infected, insert one or more sutures at either end and introduce a soft flexible catheter in the intervening opening.

(10) In all cases of complete closure of the ureteral wound, it is better to leave a cigarette drain down to the site of operation, long enough to be assured that there is no leakage. In favorable locations,

I have introduced this drain through a stab opening in the loin, after which the anterior incision is closed.

(11) In cases in which transperitoneal catheterization is practiced, it is always well to pass a pilot drain down by the side of the catheter to the site of the ureteral operation.

110. PROCEDURE FOR URETEROSTOMY (URETERO-LITHOTOMY) BY THE VAGINAL ROUTE

(1) Place the patient in the dorsal position with the thighs thoroughly flexed upon the abdomen.

(2) Draw the cervix down and backward.

(3) Divide the septum between the cervix and the bladder, carrying the dissection up to but not through the peritoneum. This incision should be ample, extending from one side of the cervix to the other, care being taken not to wound the uterine arteries.

(4) The presence of the calculus will serve as a guide to the ureter which may now be brought down with the hooked finger, or a blunt hook.

(5) An incision is made longitudinally in the ureter and the calculus delivered.

(6) The incision in the ureter may or may not be stitched. In any event it is better to insert a gauze drain.

CHAPTER VI

FOREIGN BODIES IN THE KIDNEYS

Foreign bodies of exotic origin are but rarely found in the kidneys. When they are thus found, they generally consist of bullets, or pieces of clothing carried in by gunshot wound. In certain cases, an unabsorbed suture, the remnant of a previous operation on the kidney, may act as a foreign body and become the nucleus of a stone.

Stone in the kidney is a condition of relatively frequent occurrence. It is more common among men than women. It occurs with greatest frequency between twenty and fifty, although it is known beyond these periods. It is rare in childhood, although Rafin has collected thirty-nine cases, two of which came to operation in his own practice. Guiteras saw but one case in fifteen years among the extensive Italian clientelle of the Columbus Hospital, New York. Diet abounding in either proteids or carbohydrates, largely to the exclusion of the others; wines and liquors and calcareous waters are among the predisposing causes. The active cause of calculus is the presence in the kidney of some object or substance that will act as a nucleus of crystallization. Blood clots, mucous shreds, desquamated epithelial elements, bacteria, parasites and foreign bodies have been found in the interior of concrements.

Stones in the kidney may be single or multiple, as many as several hundred having been found in one kidney. They may also be designated as primary and secondary. Primary stones, developing in acid urine, contain urates, uric acid, cystin, xanthin, but chiefly the calcium oxalates; those developing in alkaline urine consist exclusively of calcium in the form of basic phosphates, acid phosphates and carbonate in varying proportions. Secondary calculi are phosphatic in character, with either or both magnesium and ammonium as the basic elements.

Pathologic conditions associated with renal calculi are numerous. In many cases early infection occurs with more or less destruction of kidney substance. This infection may be either hematogenous or lymphogenous in origin (see Infections of the Kidney). As a rule, the progressive destruction of secretory function in the afflicted kidney is accompanied by an equally progressive compensatory development of the other kidney, where calculi may also develop.

Symptoms and Diagnosis.—Calculi of the kidney may be a symptomless condition, at least so far as subjective manifestations are concerned. This is true even when, in certain cases, destruction of kidney substance has become advanced. While this is true in a certain limited number of cases, the fact remains that in a great majority of instances, pain is an early and distressing symptom. This pain is generally autonomic in its manifestations, being referred to the deep muscular structures in the loin of the affected side. The right side is most frequently the seat of this renal colic. As the name implies, the pain is colicky, or more or less remittent in character. It cannot be said that in the course of an attack there is even a complete intermission in the pain, the patient being held constantly as in a vise. The exacerbations are generally of extreme severity and cause the patient to scream with the pain which now extends into the groin and bladder, and at times reaches the vulva, ovaries and uterus, and induces spasmodic contractions of the perineal muscles. Ordinarily there is a frequent, almost constant, desire to urinate associated with tenesmus. The urine thus voided is liable to contain albumin, with more or less blood and epithelial elements, or, in infected cases, it is turbid. Expulsion of the calculus is sometimes followed by the voidance of a long blood cast of the ureter. The symptoms are generally so severe as to induce pallor and shock with cold sweats. The agonized patient attempts to mitigate muscular pressure by drawing up the knees and flexing the body.

Hematuria may be the first symptom to attract attention, as it may occur independently of pain. It may be induced by jumping, lifting, or straining while at work, or while engaged in athletic sports. It may be slight or copious, transient or persistent. The blood, when mixed with urine, makes a dark mixture, from which coagula may be precipitated, either standing or by centrifuge. Such urine generally abounds in long worm-like casts or fibrinous shreds. Pus is present in about fifty per cent. of the cases.

As a rule, there is more or less of constipation with digestive disturbances in these cases.

The affected kidney may or may not be enlarged and, consequently, may or may not be palpable. In cases in which the kidney is sufficiently enlarged to be felt through the abdominal wall, it will generally be found to be hard and irregular. This morphology may easily be confused with that of malignant kidney.

Urinalysis in supposed nephrolithiasis should be carefully made. The urine will generally be found acid in reaction, of rather high specific gravity, and generally contains blood corpuscles, pus, some casts, and numerous cells of renal epithelium, combined with crystalline sediments. Specimens obtained by catheterization of the ureters will generally indicate the side that is involved. This may be confirmed by cystoscopic examination, by which means the diseased urine, either bloody or purulent, may be seen coming from the ureter of the affected side.

Radiographic examination has come to be the one important and generally conclusive means of diagnosis. When stones are indicated by the picture, their presence and exact location can be relied upon. When, however, no stone is shown by the picture, the fact is by no means to be taken as conclusive against an otherwise complete symptom complex of nephrolithiasis. Sometimes failure to show up stones is due to the defective technic of the radiographer. Arcelin states that instantaneous exposures are liable to show up the stones much better than longer ones, unless the kidney is completely immobilized. He insists further that the radiographer should always be present at the operation, so that he can identify the stones by their shadows and see that none is overlooked. Arcelin gives twenty-six different views of kidney stones to show the various sources of error.

In the case reported by Béclère, the symptoms indicated kidney stone and radioscopy showed a large concrement in the right side. Its shadow was 40 mm. in diameter when the tube was placed above the patient, but the shadow was only 28 mm. in diameter when the tube was placed beneath, the patient's position and the distance of the tube the same for each exposure. This difference in the size of the diameter with the upward and downward exposures indicated that the stone must have been much nearer the front than the back of the body, suggesting that it was in the gall-bladder, rather than in the kidney, although there had been no signs of anything wrong with the biliary apparatus. The hematuria was still unexplained until the tube was applied to the left side also, when a small kidney stone was discovered.

Brown (P.) emphasizes the value of what he terms the ante-operative preparation of the patient when examination for urinary calculus is to be made by means of the Roentgen ray. He advocates local compression of the area to be examined and a previous emptying of the stomach and bowel, so as temporarily to force away the intestinal content from the renal, ureteral or vesical regions. Arrangements for such an examination should be made at least 24 hours ahead. He recommends the use of castor oil as a preliminary purgative and the additional use of a soap-suds and glycerin enema shortly before the sitting.

The treatment naturally resolves itself into (a) medicinal, which embraces dietetic and hygienic, and (b) surgical.

Medical treatment is, as a rule, first demanded for relief of an attack of renal colic. Morphia or codia, in full doses, given hypodermatically, is generally required. The anodyne is generally best combined with atropin, hyoscin, or scopolamin, the last named being my choice for the relief of the renal and ureteral spasm. Sometimes an anesthetic is required to relax the spasm. Guiteras gives Basham's Mixture (*mistura ferri et ammoniæ acetatis*) in half ounce doses, three times daily, as a valuable remedy in hematuria. Ergot and chlorid of iron internally are thought to be valuable in this condition. Adrenalin may be given to meet the same indication. Urotropin is valuable as a renal antiseptic in infected cases. Water in large quantities should be given in all cases. As solvents, dilute nitro-muriatic acid may be given in phosphaturia; carburetted alkaline waters, especially Apollinaris, should be given in oxaluria; alkaline diuretic waters should be given in the presence of uric acid excess. The diet should be along precisely the same lines as that for either acute or chronic interstitial nephritis.

Surgical treatment consists primarily in surgical exploration of the kidney (q. v., page 477) and secondarily, in removal of the calculus by nephrostomy. (See Procedure 121 b.)

CHAPTER VII

FOREIGN BODIES (CALCULI) IN THE URACHUS

This condition, its symptomatology and proper treatment is best presented by the case of Dykes.

The patient was apparently healthy apart from the urinary complaint, which dated back some five years or more. Several small concretions lay free on the base of the bladder, but on commencing to crush the first, the beak of the lithotrite impinged on what appeared to be a much larger calculus occupying a position at the apex of the half-distended bladder. After the first stone had been crushed, the projecting portion of this larger calculus was easily seized between the blades of the lithotrite, but was found to be fixed to the bladder wall. To crush this calculus *in situ* appeared dangerous, if not impossible, so Dykes performed lateral lithotomy, and the forefinger passed into the bladder. The calculus was now found just within reach of the finger. With the forefinger on the tip of the calculus, and the other hand on the abdominal wall, it was estimated to be of considerable size, and its upper portion seemed very close under the examining hand beneath the abdominal wall in the middle line. It was evidently an hour-glass stone, the deeper half being considerably larger than the projecting portion felt by the finger. The projecting portion being steadied in the grasp of lithotomy forceps, the perforated end of a long probe was insinuated alongside the neck and gradually maneuvered round the whole circumference, loosening the retaining tissues till, by gentle traction and rotation of the forceps, an "hour-glass" calculus was safely delivered. A second calculus immediately dropped from the same pocket into the bladder cavity. It, together with the three small concretions, the presence of which on the bladder floor had already been detected, was now removed, and the débris of the small stone first crushed washed out. In case other concretions might still be lying in the pocket, its recesses were explored by a probe. Nothing further was found, but the probe passed up in the middle line, easily palpable through the abdominal wall to a point two inches below the umbilicus. At the upper end the pocket seemed to be contracted to a mere sinus. Convalescence was rapid and uncomplicated.

In all such cases as this the urachus should be removed (see Procedure for Patulous Urachus).

CHAPTER VIII

FOREIGN BODIES IN THE RECTUM

Foreign bodies are but rarely found resident in the rectum. They sometimes lodge there in transit from the intestinal tract through which they have made transit. I have removed from the rectum a needle and thread that had been swallowed two weeks previously, the thread evidently acting as the tractor by which the needle had been kept from a migratory course through the intestinal wall. I was once called upon to remove a piece of broken glass that had similarly passed through the entire canal, only to become lodged just within the sphincter ani muscle. It occasionally happens that a detached nozzle of a syringe slips into the rectum, and has to be delivered. The symptomatology and treatment are so obvious as to require no further discussion.

SECTION V

INFECTIONS OF THE GENITOURINARY TRACTS IN WOMEN

CHAPTER I

INTRODUCTION

The genital tract is normally the habitat of an extensive flora, which, if displaced from its immediate environment, may be productive of pathologic results. All of the sexual and urinary organs of women are, furthermore, subject to invasion by other or foreign microorganisms.

These invasions or infections, according to the active agent concerned, may involve either the cutaneous or mucous surface, or they may invade the subepithelial structures; they may advance from the point of primary involvement, either by the progressive invasion of the epithelial surface, by transit through the lymph channels, by reaching the sanguiferous circulation, or by destructive action on the subepithelial structures at the point of invasion.

The clinical phenomena resulting therefrom may be manifested in the vulva, vagina, uterus, Fallopian tubes, ovaries, the urinary tract, or in the rectum, or in any or all of these structures.

The leading pathologic phenomena are those of *inflammation* and are induced in the human organism in an effort to resist predatory invasion by pathogenic bacteria.

NORMAL BACTERIOLOGY OF THE FEMALE GENITOURINARY ORGANS

The Vulva.—The vulva is the constant seat of a numerous flora, probably more so than any other exposed portion of the skin.

The Vagina.—The vagina in the young is normally free from bacteria; with the advance of years, however, even in the instance of virgins, numerous microorganisms may be found. This invasion may take place shortly after birth, and, in some instances, the fact that these bacteria have taken up their habitat in the vagina is not followed by serious results. Baths, washings, and especially the application of oleaginous substances, such as are frequently used in the early toilet of newborn children, favor the entrance of germs. Winter found numerous organisms in the vagina and upon the pudendal structures, in neither of which were any manifestations of disease. An interesting fact was that he found staphylococci, including the *Pyogenes albus, aureus,* and *citreus,* together with numerous streptococci, all of which, in morphology, pigmentation, and behavior in culture media, were identical with similar bacteria found in other loci where they possess pathogenic properties; they differed, however, in the particular that inoculation experiments indicated that they were innocuous.

All investigators agree that all pathogenic bacteria lose their virulence the nearer they approach the cervix. This circumstance at once raises the question whether or not the cervical and vaginal secretions have the effect of depriving these bacteria of their virulence. In answer to this question may be cited the observation of Döderlein, who has found a bacillus (*B. vaginalis*) which does not grow upon many of the usual media, but may be cultivated on sugar bouillon and sugar agar. It produces an acid, apparently lactic, upon which the usual acidity of the vaginal discharge depends. Lactic acid, which is elaborated by this bacillus in considerable quantity, is presumed to be the agent which either destroys the life or neutralizes the virulence of the pathogenic organisms. In confirmation of this theory large quantities of pus-producing organisms introduced within the vagina disappeared completely within a few days. This acid-forming bacillus, which stands as a sentinel at the introitus and along the vaginal wall, does not itself produce pathologic symptoms, and consequently plays no part in the causation of sepsis. Döderlein is of the opinion that this microorganism and the products of its vitality are able to resist the invasion of streptococci, which probably never reach the uterus unless either carried there mechanically or escorted by the more powerful pus-formers. These latter, notably the gonococcus, overpower the bacillus of Döderlein and march practically unopposed to the remotest reaches of the genital tract. The fact that the *Bacillus aerogenes capsulatus* manifests its activities upon or near the cervix indicates that it is not amenable to the influence of this *Bacillus vaginalis* of Döderlein.

The investigations of Döderlein and J. Whitridge Williams show that the normal vaginal discharge is of very small quantity, of whitish, crumbling material, of the consistence and appearance of curdled milk, containing no mucus, and giving an intensely acid reaction to litmus, while microscopically it consists entirely of vaginal epithelial cells and a relatively few large bacilli. This is due to the fact that the vaginal membrane has no mucus or other secretory follicles, and that any discharge from its surface cannot, therefore, be called a secretion, but must be looked upon as the product of epithelial exfoliation with some moisture derived either from exosmosis through the membrane or, more probably, from the cervical secretion.

The pathologic discharge, on the other hand, is of a yellowish or greenish-yellow color, cream-like in consistence, often containing gas bubbles (dependent upon *Bacillus aerogenes capsulatus*) and a little mucus, and varies in reaction from weakly acid or neutral to alkaline, while microscopically it consists of epithelial cells, numerous pus corpuscles, and all kinds of bacilli.

Stroganoff found that microorganisms seemed to increase in abundance in the vaginal secretion preceding and following menstruation.

The Uterus.—The uterus at birth has no flora. Its location, the arrangement of the cervical mucosa into valve-like rugæ, the physical and chemical qualities of the cervical secretion all tend to resist invasion. In normal pregnancy the increase in volume, tenacity, and alkalinity of the cervical secretion serves as an additional safeguard against uterine infection at this critical period. This change in the secretion of the pregnant uterus carries its protective influence farther by practically eliminating pyogenic bacteria from the vagina at this period.

From just within the os externum upward, says Sir William Sinclair, the female genital tract in health is free from bacteria. Confusion has arisen from methods of obtaining material for microscopic examination and cultivation experiments. Many observers have not succeeded in getting rid of the drop of mucus at the external os, which should be considered as vaginal, and so have obtained results vitiated by the presence of vaginal bacteria in the material examined.

Another trifling question which has received too much attention is the limit of the vagina in case of laceration of the cervix. The discussion, says Sir William Sinclair, is mere logomachy. The part of the cervical canal which, by reason of laceration, is exposed to the vagina must count as vagina, from the point of view of bacteriological research. The part is well worthy of examination and comparison with the vagina and cervix proper, because of the change in the reaction of the secretion, which is alkaline within the lacerated portion; the difference in anatomic structure of the part which is cervical, and the inability of its lacerated muscle completely to contract, thus leave the fissure in a state of stagnation.

The Fallopian Tubes.—The Fallopian tubes in health have been investigated by Sinclair, who points out the fact that, from the bacteriological point of view, it is well to keep in mind that the Fallopian tube has two openings, one extremely narrow, connecting it with the cavity of the uterus, and the other, the wide abdominal orifice, connecting it with the peritoneal cavity.

Invasion of the tube by bacteria may occur from either end or through its walls under special conditions. The cavity of the uterus in health is free from germs, and so is the peritoneal cavity. Invasion through the walls of the tube only occurs in adhesion to the intestine or from bacterial disease in the pelvis. Consequently in a state of health the Fallopian tube is entirely free from germs.

Witte examined freshly extirpated and apparently healthy tubes in eleven cases. In nine cases the cultures remained absolutely sterile. In one of the remaining cases he found both the staphylococcus and the streptococcus, in the other only a sparse growth of the staphylococcus. The corresponding uterus in each case was examined at the same time, and, in the cervical canal of the first, the streptococcus and staphylococcus were found. In the second uterus the staphylococcus was discovered in the cavity of the body. In spite of the obvious cause of the presence of bacteria in the tubes Witte drew the general inference that the healthy tubes might contain microorganisms.

Winter examined forty tubes which had just been obtained by operation. He employed the usual methods of cultivation in searching for bacteria, and, although there were a few exceptions of which he considered the explanation satisfactory, he concluded that the healthy tube was free from bacteria.

Menge examined eighty-three tubes obtained from fifty women operated upon for various reasons. Exact examination by the microscope and by cultivation experiments in various ways may be assumed. He came to the same conclusion as Winter, namely, that "the normal tube is always germ-free."

PATHOGENIC INFECTION OF THE FEMALE GENITAL ORGANS

The various pathogenic infections of the female genitalia may be either *pure* or *mixed*.

(1) A *pure infection* is one in which the primary and ensuing essential pathological changes are induced by a single definitely determined pathogenic microorganism. In practically all of these cases other microorganisms sooner or later appear in the field of activity, but the fact remains that that activity derives its chief clinical characteristics from the one that serves as the initial causative factor.

(2) A *mixed infection* is one induced by various pathogenic micro-

organisms, each of which seems to play a part without exerting a determining influence upon the ensuing pathologic process.

The *pure infections* may be further classified, for convenience of study, according to the microorganism involved, as follows, viz.:

A. Pure infections:

(1) *Bacterial Group—*
- (a) The gonococcus (gonorrhea).
- (b) Spirochæta pallida (syphilis).
- (c) Bacillus of Ducrey (chancroid).
- (d) Streptococcus pyogenes (erysipelas).
- (e) Bacillus tuberculosis (tuberculosis).
- (f) Bacillus diphtheriæ (diphtheria).
- (g) Bacillus tetani (tetanus).
- (h) Bacillus typhosus (typhoid).
- (i) Staphylococcus.
- (j) Pneumococcus.
- (k) Bacillus coli communis.
- (l) Bacillus aerogenes capsulatus.

(2) *Parasitic Group—*
- (a) Trichophyton tonsurans (eczema marginatum).
- (b) Phthirius inguinalis (pediculosis pubis).
- (c) Distoma hæmatobium (bilharzia).
- (d) Filaria bancrofti (elephantiasis arabum).
- (e) Actinomyces (actinomycosis).
- (f) Echinococcus (hydatid disease).
- (g) Oidium albicans (thrush).

B. The *mixed infections* are generally designated by the names given to the various clinical and pathological entities to which they give rise, as in the following examples, viz.:

(1) *External or Cutaneous Group—*
- (1) Intertrigo.
- (2) Erythema.
- (3) Eczema.
- (4) Folliculitis.
- (5) Herpes progenitalis.

(2) *Internal or Mucous Membrane Group—*
- (1) Vaginitis.
- (2) Endometritis.
- (3) Salpingitis.
- (4) Ovaritis.

(3) *Glandular Group*—
    (1) Bartholinitis.
    (2) Mastitis.
    (3) Lymphangitis (glandular).

(4) *Vascular Group*—
    (1) Phlebitis.
    (2) Lymphangitis (vascular).

CHAPTER II

GONOCOCCUS INFECTION OF THE GENITOURINARY TRACTS IN WOMEN

This is an infection by the diplococcus of Neisser, causing the symptom-complex of gonorrhea.

The Organism.—The *Micrococcus gonorrhœæ,* familiarly known as the gonococcus of Neisser, is a micrococcus occurring in pairs or in groups of four, but generally in the form of diplococci. Its elements are flattened or "biscuit-shaped." "The flattened surfaces," says Sternberg, "face each other and are separated, in stained preparations, by an unstained interspace. The diameter of an associated pair of cells varies from 0.8 μ to 1.6 μ in the long diameter—average about 1.25 μ —and from 0.6 μ to 0.8 μ in the line of the interspace between the biscuit-shaped elements, which sometimes present a slight concavity of the flattened surfaces. Multiplication occurs alternately in two planes, and as a result of this groups of four are frequently observed. But diplococci are more numerous and are considered as the characteristic mode of grouping. Single, spherical, undivided cells are rarely seen." There are other microorganisms with a morphology identical with the gonococcus, which, therefore, must depend for its distinction upon other features. Among other facts to be taken into consideration in this connection are its response to staining agents; the fact that it is aerobic; that it is a strict parasite; that in culture media it is self-limiting in its vitality; that it will not develop below 25° C. (77° F.) or above 38° C. (100.4° F.); that exposed to 60° C. (140° F.) for ten minutes it dies; and, finally, it is distinguished by the clinical phenomena attending its occurrence. Studied pathogenetically it has been demonstrated to cause the form of inflammation known as gonorrhea upon the mucous membrane of the urethra, the cervix uteri, the corpus uteri, and the vagina of children; while the vaginal mucous membrane of adults appears to be immune. The conjunctiva is also capable of inoculation—a fact which accounts for the frequent occurrence of ophthalmia neonatorum. Bockhart has found that the gonococci penetrate into the deeper layers of the urethral mucous membrane, even into the corpus cavernosum, although Bumm is of the opinion that, as a rule, the epithelial layer of the mucous membrane is alone involved. In its later stages gonorrhea often becomes a mixed infection, owing to the presence of the *Staphylococcus pyogenes aureus,* upon which, rather than upon the gonococcus, all metastatic manifestations depend.

Gonorrhea in women was once thought to be a disease restricted to the vulva, the vagina, and the urethra; but, since the days of Tait and Noeggerath, it is known that infection of the lower genital canal, if left to itself, may become a progressive invasion of the mucous tract, causing infection of the endometrium, the Fallopian tubes, the peritoneum, and the pelvic lymphatics. It should be remembered, likewise, that the lower segment of the urethra is also, coincidentally with the vagina and vulva, a seat of primary infection, and that from this locus it may extend upward, involving the bladder and even the kidneys. The morbific agent is distributed chiefly through the avenue of the "social evil," and restrictive measures have been taken in all enlightened communities to diminish its ravages. The prevalence of this microorganism in the vaginal discharges of prostitutes has been a frequent subject of investigation. Laser, of Königsberg, examined a number of prostitutes, with the result that the gonococcus was found in the urethra 111 times in 353 cases; in the vagina 7 times in 180 cases; and in the cervical canal 21 times in 67 cases. These figures indicate that this microorganism finds a favorable habitat equally in the urethra and in the neck of the uterus, and the least favorable abiding place in the vagina —a conclusion which supports the observation of Döderlein relative to the inhibitory action of the acid-forming bacillus of the vagina. Out of the 353 patients examined by Laser for gonococci in the urethra four-fifths of the 111 cases that revealed this microorganism gave no microscopical evidence of gonorrhea. In 241 patients in whom no gonococci were discovered there was more or less inflammation of the mucosa, often with a suspicious discharge. It follows, therefore, that, while infection of the genital and urinary tracts may depend upon organisms other than the gonococcus, the latter, in a degenerated form located deep in the mucous folds and follicles, but especially in the crypts of the vulvovaginal gland, may be a persistent cause of the disease, even when it cannot be detected in the discharges. It is evident from these facts that gonorrhea in women may be either active or latent, and that latent gonorrhea, so latent as to escape observation without microscopic examination, may be communicated to innocent parties.

Afanassiew reports the results of bacteriological investigation of the lochia of twenty-four parturient women. Out of sixty-eight examinations he obtained cultures in nearly all the cases. The bacteria diminished in the vagina from without inward, and were fewest at the uterine cavity—an observation confirmatory of the conclusions of Döderlein. They were living and culturable, notwithstanding daily washing of the canal with carbolized water of 2 per cent. strength.

GONOCOCCUS INFECTION OF THE VULVA AND VAGINA

The pathology of active gonorrhea is essentially that of inflammation of the involved membranous areas from the vulval integument and the ostium vaginæ to the morsus diaboli of the Fallopian tubes and the ovaries, and from the meatus urinarius to the kidneys. In the absence of cleanliness or proper treatment the vulval epithelium is often destroyed in limited areas, the infection thereby reaching the deeper cutaneous layer and resulting in the development of warty excrescences, the condylomata accuminata (q. v.). The same phenomena are manifested in the vagina. The writer has observed condylomata involving the lower, but never the middle or upper, zone of the vagina. The extension of the infection into the vulvovaginal gland results in inflammation with occlusion of the ducts, and eventually in abscess.

GONOCOCCUS INFECTION OF THE VULVOVAGINAL GLAND

(*Bartholinitis*)

Gonorrheal infection always involves the ostia of the vulvovaginal ducts, sometimes the ducts themselves, and occasionally the disease extends up to and involves the glands.

These glands, otherwise known as the glands of Bartholin, are described by Rothrock as two small rounded or oval bodies from 15 to 20 mm. in length, varying greatly in size and shape, and situated in the posterior third of the labia majora, one on either side of the lower end of the vagina, immediately below the bulb and in front of and near the upper margin of the perineal septum.

They are racemose glands, the acini of which are lined by a single layer of high columnar epithelial cells with basal nuclei. They secrete a mucoserous fluid which is emptied through two slender ducts of about 2 cm. in length and terminating in small openings in the vestibule about 1.5 cm. from the posterior median line just outside the hymen. These ducts are lined by low cuboidal epithelial cells and their mouths are plainly visible on close inspection, being of sufficient size to admit the passage of a fine probe. Functionally the secretion of these glands serves to moisten the mucous membrane of the vestibule, and during sexual excitation or coitus it is discharged in considerable quantities. These glands become fully developed at the age of puberty, and maintain their full function until the climacteric, when they begin slowly to undergo atrophy and their function gradually ceases. The location of the mouths of these ducts renders them peculiarly liable to infection, which may, by extension through the duct, involve the gland and result in a series of inflammatory conditions constituting the chief diseases to which it is liable.

Inflammation must be regarded as invariably due to bacterial infection, and cases apparently the result of trauma, as, for example, those following on childbirth, are now generally explained by the preexistence of pathogenic bacteria in the duct, the trauma having served to afford an atrium of infection. While various members of the bacterial flora of the vulva may gain entrance to these ducts, inflammation is almost invariably of gonorrheal origin. The one possible exception to this is the staphylococcus, which, it appears, may produce inflammation either alone or in association with the gonococcus. All other bacteria, therefore, which may at times be present must be regarded in the light of secondary invaders.

The ducts are more liable to be infected than are the glands themselves, although the upward extension of the disease is frequently observed. Bumm had a well-developed case of gonorrheal inflammation of the vulvovaginal gland fourteen days after exposure to infection, but this is exceptional, and frequently weeks or months may elapse before the mouths of the ducts become infected, although constantly bathed meanwhile with vulvar or vaginal secretions. In most instances both ducts are involved, frequently from the beginning, but almost invariably in cases of long standing. The ducts are usually involved throughout their entire length, though oftentimes the involvement is not uniform throughout, but some portions of the duct are more severely attacked than others.

Herbert found the histological changes to consist essentially of desquamation of the epithelial cells with a small round-celled infiltration of the intercellular substance and subepithelial connective tissue.

At first the epithelium lining of the duct becomes swollen, and eventually loosened, by the infiltration of leukocytes, then desquamation begins. In cases of long standing the desquamated epithelial cells are replaced by cells more cuboidal in character, often approaching the squamous type. The lumen of the duct will be found filled with pus and desquamated epithelial cells, in which gonococci may be demonstrated. The gonococci may penetrate to the subepithelial connective tissue, but are not found in the infiltration cells themselves.

Gonorrheal inflammation of the ducts either begins as a chronic process or, after a brief and ill-defined acute stage, becomes chronic.

It may persist for months and even years, an ever-fruitful source of infection, and, indeed, together with infection of Skene's glands, may constitute the only points of relatively permanent localization of the infection in women. It usually occurs some time during sexually active life, though Fischer has observed it in children.

When the infection reaches the parenchyma of the vulvovaginal gland it is always of the mixed variety. The *Staphylococcus pyogenes aureus,* occasionally the *Staphylococcus pyogenes albus,* either in association with the gonococcus or alone, and in a few instances the *Streptococcus pyogenes* have been found present (Dujon). In addition to these various other bacteria are sometimes present in the pus, frequently the *Bacillus coli communis,* and in one case of relapsing abscess, examined by Rothrock, the *Bacillus pyocyaneus* was present, together with the *Staphylococcus pyogenes aureus* and other undetermined bacilli.

The pus has frequently a foul odor similar to that so often met with in abscesses occurring about the anus, and in all probability due to the associated presence of the colon bacillus or putrefactive bacteria.

Inflammation of the gland is almost always secondary to inflammation of the duct, though Rothrock recalls a case which had been under observation for some time in which there was no evidence of disease of the ducts, old or recent. In this case the *Staphylococcus pyogenes aureus* was found in pure culture, and no gonococci were demonstrable in the pus.

Abscess of the gland may occur at any stage in the progress of disease in the duct, and, according to Bumm, it occurs in about one-third of all cases of gonorrheal infection of the duct. It is frequently met with in prostitutes, in whom gonorrheal infection is unusually common. In this class of patients the traumatism incident to the abuse of coitus seems to be a fruitful exciting cause.

Not infrequently it is met with immediately following menstruation, in the absence of any history of traumatism.

Abscess usually develops unilaterally and may occur on either side, appearing to have no predilection for one side over the other. In case the disease runs a very acute course the parenchyma of the gland is quickly destroyed, and the infection may pass through the membrana propria into the surrounding cellular tissue, with a resulting phlegmon which terminates in suppuration, with the formation of an abscess. Usually, however, the inflammation runs a less acute course and remains confined to the capsule of the gland, which quickly becomes distended with pus. In such cases the cellular tissue outside the gland becomes edematous, and this in a large measure accounts for the swelling which is present.

GONOCOCCUS INFECTION OF THE UTERUS

In the uterus gonorrheal infection, which speedily becomes a mixed infection, is characterized by an immediate turgescence of the subepithelial capillaries, with a consequent overstimulation of glandular activity. The influence of the microorganisms or of their toxins is such as to destroy in some cases the superficial epithelium in the more exposed area, while the germs themselves penetrate deeply into the mucous folds and the utricular follicles. The stage of inflammatory exudation is speedily reached, and differs from the same stage of inflammation in other tissues in the fact that there is no underlying submucous connective tissue to become the receptacle of the transuded liquor sanguinis and the migrated cellular elements of hematogenous origin. The exudation, on the other hand, takes place, at least to an important degree, directly among the fibrillæ of the myometrium. In exceptional cases, however, the exudation takes place more distinctly between the mucous membrane and the muscularis, with the result that the former is sometimes separated, in part at least, from the latter. It is this condition that occasions severe dysmenorrhea. Winter asserts that it is the origin of some cases of dysmenorrhea of the membranous variety. The seroalbuminous deposit gives to stained sections an appearance more transparent than is observed in the normal mucous membrane.

The changes incident to resolution now manifest themselves in the disappearance of the liquid elements of the exudate, and in the migration of the leukocytes toward the surface or into the minute lymphatics, until presently both the cellular and the non-cellular elements of the exudation have disappeared. In many cases, however, in consequence of the peculiar structure of the endometrium, there exist within the deep follicles bacterial elements which, modified in their virulence, perpetuate in a lesser degree the original inflammatory changes. The persistence of this irritation is sufficient not only to prevent the resorption of the exuded elements, but to effect their continued deposition and organization. The result is a distinct hyperplasia, characterized by an increased thickness of the mucous membrane.

A section of the uterine mucosa at this time shows that it is of increased depth, while its cellular elements are not only relatively, but absolutely, increased in number. The leukocytes are found in some cases in large interstitial deposits, while the blood vessels themselves show but slight thickening of their walls. As a result of these interstitial deposits increased pressure is exercised upon the glands, which now seem smaller and relatively fewer in number. In this stage bacterial elements have generally disappeared from the secretion, the withdrawal of their influence resulting in the more or less speedy supervention of the next stage of the process; this is characterized by an absorption, to a certain degree, of the remaining free elements of exudation, but without any material diminution in the number or size of the hyperplastic products. These, on the contrary, continue to exercise pressure upon the already compressed glands, which now undergo atrophy; or, as may happen, an efferent duct may become occluded and the underlying follicle thus become converted into a retention cyst. Some of the glands, instead of being at right angles to the mucous surface, as under normal conditions, become oblique, and the stroma is characterized by increased density, and on section shows cells that have become elongated and arranged in bundles and fasciculi. The changes that are now presented are very much like those observable in the senile uterus. In these cases there is generally diffuse sclerosis of the muscularis.

The most ordinary and more or less persistent change following an acute infection of the uterus is that of *glandular hypertrophic endometritis.* In this form the cellular changes are restricted chiefly to hyperplastic changes. The result is essentially one of increased glandular development, with corresponding increase of functional capacity. The glands seem to be increased in size and number, and to be studded more closely together than in normal conditions. The exuberance of epithelial cell growth results in an apparent thickening of the endometrium, which now appears to be arranged in slight folds, on the apices of which, more distinctly than elsewhere, the cell development seems to be luxuriant. On section the mucous glands, instead of being straight tubules projecting downward into the stroma, are found to be tortuous, or in other cases to show simple deviation in axis. On cross section their calibers are found to be widened, their lumen being largely occupied by the exuberant cell growth. In this class of cases the lumen of the mucous gland often becomes so distended with newly formed epithelial elements that the latter project from the ostium and appear upon the surface with a sort of granulation. In the more distinctly hyperplastic varieties there seems to be not only an increase in the number of the tissue elements, but a multiplication of the glands themselves. These glands increase in size and number, and sometimes show a marked increase in the interglandular stroma. The exuberant cell growth in these cases results in a thickening of the mucous membrane, the surface of which presents a fungus endometritis. As the epithelial cells develop from the matrix there is demonstrable a certain proliferation of the sanguiniferous capillaries to give them support. The cell growth is, however, so active that it gets beyond the influence of the nutrient supply and undergoes fatty degeneration. When this occurs the terminal filaments of the newly proliferated vessels are exposed and hemorrhage results.

GONOCOCCUS INFECTION OF THE FALLOPIAN TUBES

The *Fallopian tubes* are the frequent seat of gonorrheal infection, which reaches them from below by progressive invasion of the mucous surface. It is established with reasonable certainty that this migration is never effected through the lymph channels. In the *active* or *acute* form the normal secretion of the tube is but slightly changed. According to J. C. Clark, the consistence of this secretion is at first fluid, later mucoid, the color being transparent, whitish, milky, or reddish, according as it is mixed with desquamated epithelium and leukocytes, or with red blood cells. One of the most striking microscopical changes in the acute process is the marked congestion of the blood vessels, which are greatly reddened and injected, and present a rib-like appearance beneath the peritoneal covering of the tube. With the increase in length and thickness of the tube through these morbid changes the tube usually becomes kinked and twisted upon itself, because the mesosalpinx maintains, without any relaxation, its normal relationship to the tubes; consequently the latter, as it becomes lengthened and enlarged, is thrown into a distorted shape. The fimbriated end of the tube, being the seat of terminal vessels, is greatly congested, of a bluish-red color (cockscomb color), and a stringy, glairy mucous is either seen escaping or may be expressed from the abdominal orifice.

From the very beginning of the inflammatory process the secretion of the tube may assume a purulent character. Menge asserts that this is the rule in gonococcus infection, and yet Döderlein, to a certain extent, negatives this statement by the report of a case of double gonorrheal tubal inflammation in which myriads of gonococci were found; on one side there was a pyosalpinx, while on the other only a simple tubal catarrh had occurred.

The mucosa is greatly increased in thickness, both on account of the hypertrophy of its constituent cells, and because of the vascular congestion of the villi. At this stage a transverse section of the tube presents a rosette-like appearance, the mucosa projecting rather prominently over the peritoneal edges. In the acute stage of the inflammation the morbid changes may be confined entirely to the epithelial lining and the immediately underlying connective-tissue stroma, whence the term endosalpingitis.

So long as the inflammatory condition is strictly limited to the mucosa the outward appearance of the tube, with the exception of the vascular injection and reddening, presents no other changes. Indeed, in the acute stage, especially when there is no increase in the tubal secretion, the appearances are strikingly like those of the tube in its period of normal congestion during the menstrual flux.

Notwithstanding a considerable increase in the secretion of the tube due to the local irritation of the infectious agent, the tubal epithelium remains intact much more frequently than would be supposed. The underlying connective-tissue stroma and not the epithelium is the chief seat of the initial inflammatory changes in acute catarrhal salpingitis.

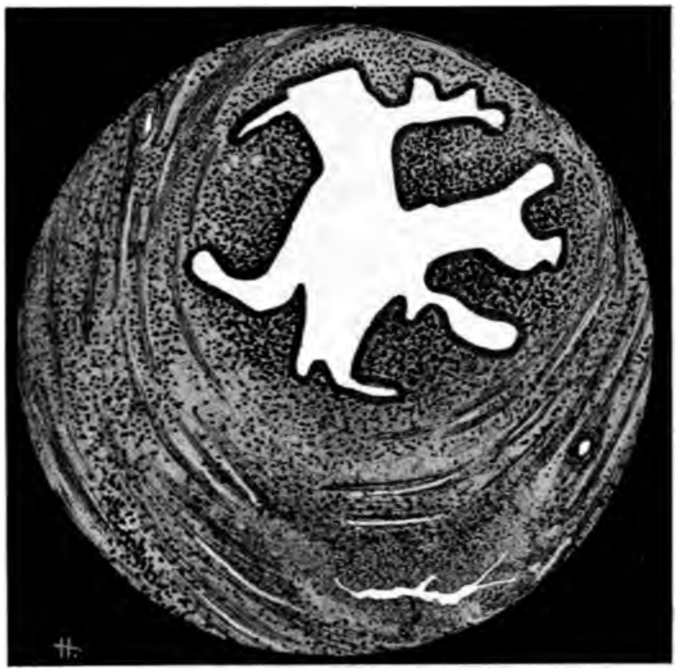


FIG. 248.—GONOCOCCUS INFECTION OF THE FALLOPIAN TUBE, SHOWING ROUND-CELLED INFILTRATION WITH BEGINNING SUPPURATION IN THE STROMA.

On section the mucous membrane presents many folds and duplicatures which form, through contact of their free ends, bay-like or loculate spaces. The stroma cells are much richer in nuclei and the blood vessels are greatly widened, and show considerable transmigration of polynuclear leukocytes (Fig. 248).

In the latent or chronic form of tubal gonorrhea marked involvement of the muscularis of the tube is the first striking phenomenon. The serpentine course of the tube becomes more pronounced and sharp quantities. These glands become fully developed at the age of puberty, and maintain their full function until the climacteric, when they begin slowly to undergo atrophy and their function gradually ceases. The location of the mouths of these ducts renders them peculiarly liable to infection, which may, by extension through the duct, involve the gland and result in a series of inflammatory conditions constituting the chief diseases to which it is liable.

Inflammation must be regarded as invariably due to bacterial infection, and cases apparently the result of trauma, as, for example, those following on childbirth, are now generally explained by the preexistence of pathogenic bacteria in the duct, the trauma having served to afford an atrium of infection. While various members of the bacterial flora of the vulva may gain entrance to these ducts, inflammation is almost invariably of gonorrheal origin. The one possible exception to this is the staphylococcus, which, it appears, may produce inflammation either alone or in association with the gonococcus. All other bacteria, therefore, which may at times be present must be regarded in the light of secondary invaders.

The ducts are more liable to be infected than are the glands themselves, although the upward extension of the disease is frequently observed. Bumm had a well-developed case of gonorrheal inflammation of the vulvovaginal gland fourteen days after exposure to infection, but this is exceptional, and frequently weeks or months may elapse before the mouths of the ducts become infected, although constantly bathed meanwhile with vulvar or vaginal secretions. In most instances both ducts are involved, frequently from the beginning, but almost invariably in cases of long standing. The ducts are usually involved throughout their entire length, though oftentimes the involvement is not uniform throughout, but some portions of the duct are more severely attacked than others.

Herbert found the histological changes to consist essentially of desquamation of the epithelial cells with a small round-celled infiltration of the intercellular substance and subepithelial connective tissue.

At first the epithelium lining of the duct becomes swollen, and eventually loosened, by the infiltration of leukocytes, then desquamation begins. In cases of long standing the desquamated epithelial cells are replaced by cells more cuboidal in character, often approaching the squamous type. The lumen of the duct will be found filled with pus and desquamated epithelial cells, in which gonococci may be demonstrated. The gonococci may penetrate to the subepithelial connective tissue, but are not found in the infiltration cells themselves.

Gonorrheal inflammation of the ducts either begins as a chronic process or, after a brief and ill-defined acute stage, becomes chronic.

It may persist for months and even years, an ever-fruitful source of infection, and, indeed, together with infection of Skene's glands, may constitute the only points of relatively permanent localization of the infection in women. It usually occurs some time during sexually active life, though Fischer has observed it in children.

When the infection reaches the parenchyma of the vulvovaginal gland it is always of the mixed variety. The *Staphylococcus pyogenes aureus,* occasionally the *Staphylococcus pyogenes albus,* either in association with the gonococcus or alone, and in a few instances the *Streptococcus pyogenes* have been found present (Dujon). In addition to these various other bacteria are sometimes present in the pus, frequently the *Bacillus coli communis,* and in one case of relapsing abscess, examined by Rothrock, the *Bacillus pyocyaneus* was present, together with the *Staphylococcus pyogenes aureus* and other undetermined bacilli.

The pus has frequently a foul odor similar to that so often met with in abscesses occurring about the anus, and in all probability due to the associated presence of the colon bacillus or putrefactive bacteria.

Inflammation of the gland is almost always secondary to inflammation of the duct, though Rothrock recalls a case which had been under observation for some time in which there was no evidence of disease of the ducts, old or recent. In this case the *Staphylococcus pyogenes aureus* was found in pure culture, and no gonococci were demonstrable in the pus.

Abscess of the gland may occur at any stage in the progress of disease in the duct, and, according to Bumm, it occurs in about one-third of all cases of gonorrheal infection of the duct. It is frequently met with in prostitutes, in whom gonorrheal infection is unusually common. In this class of patients the traumatism incident to the abuse of coitus seems to be a fruitful exciting cause.

Not infrequently it is met with immediately following menstruation, in the absence of any history of traumatism.

Abscess usually develops unilaterally and may occur on either side, appearing to have no predilection for one side over the other. In case the disease runs a very acute course the parenchyma of the gland is quickly destroyed, and the infection may pass through the membrana propria into the surrounding cellular tissue, with a resulting phlegmon which terminates in suppuration, with the formation of an abscess. Usually, however, the inflammation runs a less acute course and remains confined to the capsule of the gland, which quickly becomes distended with pus. In such cases the cellular tissue outside the gland becomes edematous, and this in a large measure accounts for the swelling which is present.

GONOCOCCUS INFECTION OF THE UTERUS

In the uterus gonorrheal infection, which speedily becomes a mixed infection, is characterized by an immediate turgescence of the subepithelial capillaries, with a consequent overstimulation of glandular activity. The influence of the microorganisms or of their toxins is such as to destroy in some cases the superficial epithelium in the more exposed area, while the germs themselves penetrate deeply into the mucous folds and the utricular follicles. The stage of inflammatory exudation is speedily reached, and differs from the same stage of inflammation in other tissues in the fact that there is no underlying submucous connective tissue to become the receptacle of the transuded liquor sanguinis and the migrated cellular elements of hematogenous origin. The exudation, on the other hand, takes place, at least to an important degree, directly among the fibrillæ of the myometrium. In exceptional cases, however, the exudation takes place more distinctly between the mucous membrane and the muscularis, with the result that the former is sometimes separated, in part at least, from the latter. It is this condition that occasions severe dysmenorrhea. Winter asserts that it is the origin of some cases of dysmenorrhea of the membranous variety. The seroalbuminous deposit gives to stained sections an appearance more transparent than is observed in the normal mucous membrane.

The changes incident to resolution now manifest themselves in the disappearance of the liquid elements of the exudate, and in the migration of the leukocytes toward the surface or into the minute lymphatics, until presently both the cellular and the non-cellular elements of the exudation have disappeared. In many cases, however, in consequence of the peculiar structure of the endometrium, there exist within the deep follicles bacterial elements which, modified in their virulence, perpetuate in a lesser degree the original inflammatory changes. The persistence of this irritation is sufficient not only to prevent the resorption of the exuded elements, but to effect their continued deposition and organization. The result is a distinct hyperplasia, characterized by an increased thickness of the mucous membrane.

A section of the uterine mucosa at this time shows that it is of increased depth, while its cellular elements are not only relatively, but absolutely, increased in number. The leukocytes are found in some cases in large interstitial deposits, while the blood vessels themselves show but slight thickening of their walls. As a result of these interstitial deposits increased pressure is exercised upon the glands, which now seem smaller and relatively fewer in number. In this stage bacterial elements have generally disappeared from the secretion, the withdrawal of their influence resulting in the more or less speedy supervention of the next stage of the process; this is characterized by an absorption, to a certain degree, of the remaining free elements of exudation, but without any material diminution in the number or size of the hyperplastic products. These, on the contrary, continue to exercise pressure upon the already compressed glands, which now undergo atrophy; or, as may happen, an efferent duct may become occluded and the underlying follicle thus become converted into a retention cyst. Some of the glands, instead of being at right angles to the mucous surface, as under normal conditions, become oblique, and the stroma is characterized by increased density, and on section shows cells that have become elongated and arranged in bundles and fasciculi. The changes that are now presented are very much like those observable in the senile uterus. In these cases there is generally diffuse sclerosis of the muscularis.

The most ordinary and more or less persistent change following an acute infection of the uterus is that of *glandular hypertrophic endometritis.* In this form the cellular changes are restricted chiefly to hyperplastic changes. The result is essentially one of increased glandular development, with corresponding increase of functional capacity. The glands seem to be increased in size and number, and to be studded more closely together than in normal conditions. The exuberance of epithelial cell growth results in an apparent thickening of the endometrium, which now appears to be arranged in slight folds, on the apices of which, more distinctly than elsewhere, the cell development seems to be luxuriant. On section the mucous glands, instead of being straight tubules projecting downward into the stroma, are found to be tortuous, or in other cases to show simple deviation in axis. On cross section their calibers are found to be widened, their lumen being largely occupied by the exuberant cell growth. In this class of cases the lumen of the mucous gland often becomes so distended with newly formed epithelial elements that the latter project from the ostium and appear upon the surface with a sort of granulation. In the more distinctly hyperplastic varieties there seems to be not only an increase in the number of the tissue elements, but a multiplication of the glands themselves. These glands increase in size and number, and sometimes show a marked increase in the interglandular stroma. The exuberant cell growth in these cases results in a thickening of the mucous membrane, the surface of which presents a fungus endometritis. As the epithelial cells develop from the matrix there is demonstrable a certain proliferation of the sanguiniferous capillaries to give them support. The cell growth is, however, so active that it gets beyond the influence of the vascular injection and reddening, presents no other changes. Indeed, in the acute stage, especially when there is no increase in the tubal secretion, the appearances are strikingly like those of the tube in its period of normal congestion during the menstrual flux.

Notwithstanding a considerable increase in the secretion of the tube due to the local irritation of the infectious agent, the tubal epithelium remains intact much more frequently than would be supposed. The underlying connective-tissue stroma and not the epithelium is the chief seat of the initial inflammatory changes in acute catarrhal salpingitis.

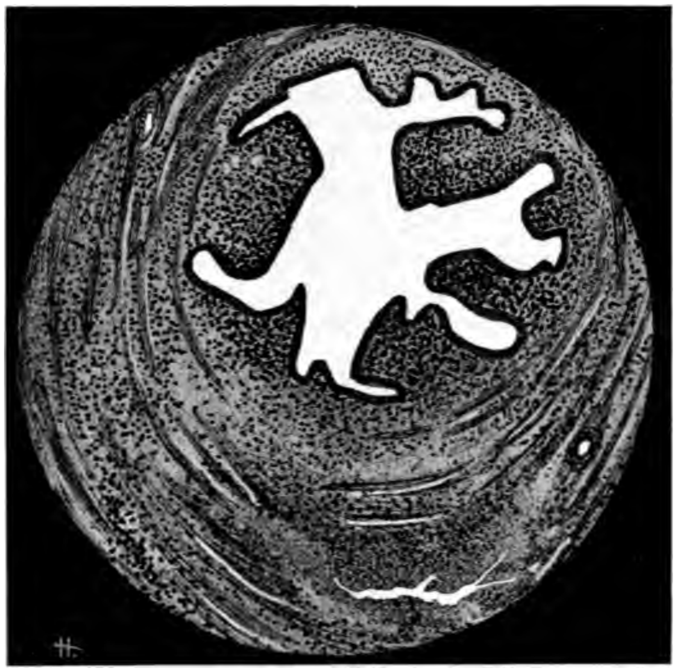


FIG. 248.—GONOCOCCUS INFECTION OF THE FALLOPIAN TUBE, SHOWING ROUND-CELLED INFILTRATION WITH BEGINNING SUPPURATION IN THE STROMA.

On section the mucous membrane presents many folds and duplicatures which form, through contact of their free ends, bay-like or loculate spaces. The stroma cells are much richer in nuclei and the blood vessels are greatly widened, and show considerable transmigration of polynuclear leukocytes (Fig. 248).

In the latent or chronic form of tubal gonorrhea marked involvement of the muscularis of the tube is the first striking phenomenon. The serpentine course of the tube becomes more pronounced and sharp intact, and, through the accumulation of a catarrhal secretion, be transformed into larger cystic cavities; or from a ciliated cylindrical type the epithelium may undergo retrograde change until it assumes a flattened or endothelial-like appearance (Fig. 249).

Through the projection of the fusiform villi into the lumen adhesions may take place between opposing ends and thus establish connective tissue bridges from one part of the tube to another. The occurrence of the gland-like space has further strengthened Hennig and Bland Sutton in their belief in the true adenoid nature of these structures. As stated in preceding pages, this theory has found but few supporters, for the adventitious way in which these spaces are formed becomes too manifest on critical examination.

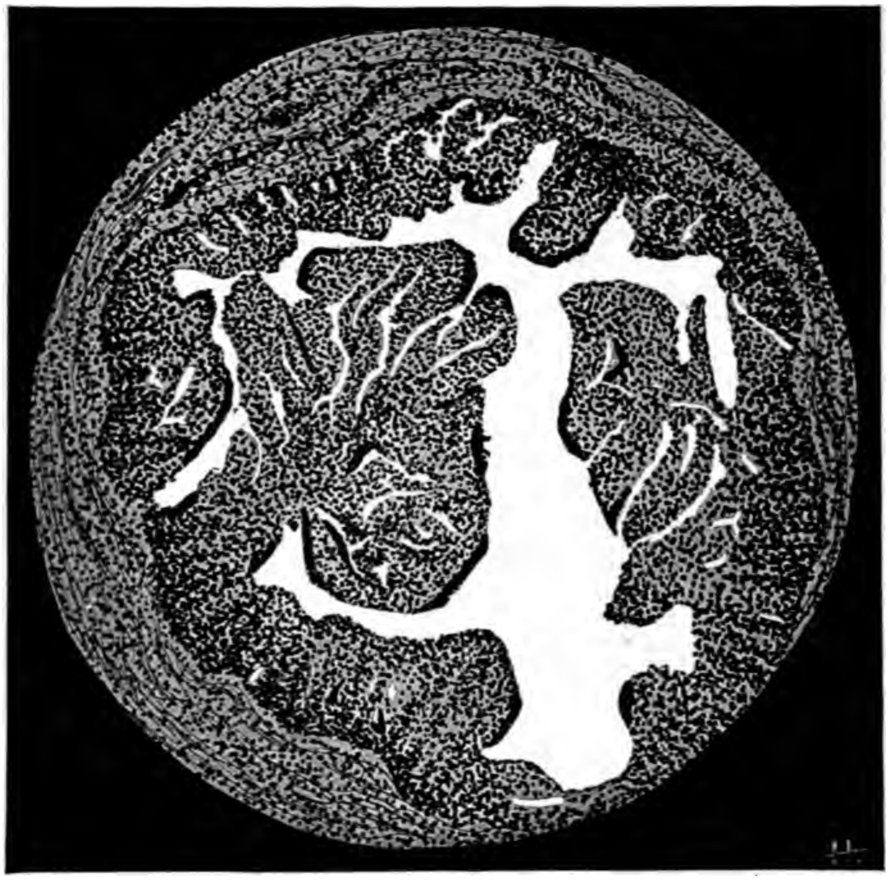


FIG. 249.—SMALL ROUND-CELLED INFILTRATION AT TIMES OCCURRING BENEATH THE MUCOSA, BECOMING GENERALIZED IN THE CHRONIC PROCESS UNTIL THE ENTIRE TUBAL WALL BECOMES INVOLVED.

ture may take place, which divides a simple hydrosalpinx into two or more chambers.

According to Rokitansky, the occlusion of the fimbriated end is due to the adhesion of the peritoneal surfaces of the fimbriæ, which become inverted within the tube. Kolb offers a similar explanation and attributes the adhesions to a tubal catarrh, perisalpingitis, or pelviperitonitis.

According to Klebs, atrophy of the fimbriæ may result from a localized inflammation leading to an inversion of the fimbriæ and a filling-in of the ostium abdominale with scar tissue. While these strictures of the tube may result, in rare instances, from other than inflammatory causes, as, for instance, the dropsical accumulation in the tube in certain cases of myoma, nevertheless, the chief inciting factor is undoubtedly a perisalpingitis. Whether the inflammatory condition is always of bacterial origin is as yet an open question. Menge and others have, for instance, described numerous cases in which the occlusion occurred through a sterile process, such as the chemical irritation of hemorrhagic accumulations, and from the mechanical congestion due to the pressure of tumors, etc. These cases, however, are comparatively rare, and, as a rule, the first cause may be accepted as the chief one.

While it is generally conceded that hydrosalpinx is *sui generis* a dropsical accumulation, yet such eminent authorities as Zweifel and Bland Sutton believe that it may result from the resolution of a pyosalpinx, the purulent matter undergoing a transformation into an aqueous accumulation, but Menge, Kleinhaus, and others, as the result of careful observation, state with positive assurance that such a retrograde metamorphosis is not possible.

The tubal secretion may be of a clear, limpid, a yellowish lemon, or a slightly blood-tinged color, and its formed elements may consist of leukocytes, epithelium, red blood cells, and sometimes cholesterin crystals. To the latter Bland Sutton ascribes the greenish color occasionally noted in the fluid.

With the progressive increase in the size of the tube the mucosa loses its coral-like or villous appearance, becomes greatly stretched, and may undergo such complete atrophy as to leave only the small ridges before described, or, as is seen in some cases, only small, blunt, teat-like eminences.

Of the mucosa the epithelium alone remains, and this is usually transformed into a cuboidal or flattened variety; in the deep angles and protected areas it may, however, still maintain its cylindrical character, and even the cilia may remain intact.

As a unique and rare production bone-like or calcareous plates are found in the walls of the tubes, or, as illustrated by Cullen's case, the tube may contain a calculus.

Hydrosalpinx does not, as a rule, reach a large size, although cases are reported in which the contents measured a liter or more.

With regard to the comparative frequency of single or double hydrosalpinx, it is usually stated that the double form is the more common. To the contrary, however, Cullen states that in a series of 27 cases he found 17 unilateral, while the remainder were bilateral.

TYPES OF HYDROSALPINX.—Certain deviations in morphology from the simple form just described constitute special types of hydrosalpinx. Occlusion of the tube in salpingitis pseudofollicularis, with its subsequent enlargement, constitutes hydrosalpinx pseudofollicularis. In this condition the tube rarely reaches such a large size as the simple form, from purely mechanical reasons, for it is self-evident that a cavity divided into numerous loculi can not distend, on account of increased resistance, with the same facility as a unilocular cavity.

Cross sections of the tube present a sponge-like or irregular punched-out appearance, the larger cavities being lined with cuboidal, the smaller with simple cylindrical, or ciliated, epithelium. In some spaces desquamated epithelia are seen.

A special variety, named not because of its histological deviation from the simple variety, but on account of its intermittent discharge of fluid into the uterus, is the *hydrops tubæ profluens.* In these cases the tube may reach a very large size before the sphincter-like action at the uterine cornu is overcome, when a profuse serous flux is noticed by the patient. This is a comparatively rare condition, only isolated instances having been reported from even the largest clinics.

This peculiar intermittent action of the tube is attributed to several causes. According to Landau, the muscular walls at the uterine juncture are greatly hypertrophied, and only when this constriction is overcome by the *vis a tergo* of the serous accumulation is the periodical flow inaugurated.

Other investigators have attributed this condition to a stricture of the tube which, like the kinked garden hose, is only overcome by the gradual increase in pressure behind the point of constriction.

The last variety of hydrosalpinx, known as *tuboovarian cyst,* is a pathologic condition in which the hydrops tubæ is associated, by organic union, with a cystic condition of the ovary, the fluid from one cavity mingling with that of the other (Fig. 250).

These aqueous tumors vary from a very small to a very large size, reaching in some instances a diameter equivalent to that of a child's head. With a free communication between two secreting cavities, such as one finds in these cases, it is quite natural for the cystic tumor to reach much larger dimensions than the simple hydrosalpinx.

The Fallopian tube is situated upon the upper surface of the tumor and usually appears as a large, club-shaped, or retort-shaped body, which is fused at its fimbriated extremity upon the surface of the ovary by adhesions of more or less density, depending upon the chronicity of the inflammatory process.

The communication between the cystic portion of the ovary and the tube may be established either by the primary adhesion of the spread-out fimbriæ upon the surface of the cyst, with a subsequent rupture into the tube, or the free fimbriæ may become incarcerated within the ruptured opening of a cystic Graafian follicle or other ovarian cyst. In general appearance the tubal portion of this combined tumor does not differ from the usual hydrosalpinx, while the ovarian portion conforms to the usual classification of the simple unilocular, multilocular, or glandular cysts.

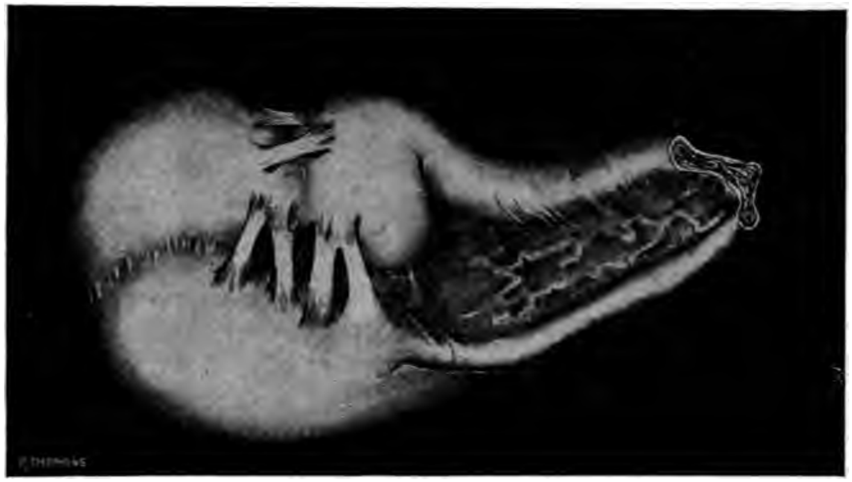


FIG. 250.—TYPE OF HYDROSALPINX THAT IS OFTEN SPOKEN OF AS TUBO-OVARIAN CYST.

Where the adhesions are quite dense and the tube and ovary are fused together in a very close organic mass it may be difficult or impossible to recognize macroscopically the loculi which originate in the ovary from those of the tube. In such instances, however, a distinction may be made microscopically, through the recognition of the characteristic ovarian stroma and constituent cells of the Graafian follicle.

Hematosalpinx (*Sactosalpinx hæmorrhagica*).—Hematosalpinx is a collection of blood within an occluded tube, similar to the serous colis usually much more marked. The extent of the involvement is variable, and the size of the tube and the thickness of its walls depend upon the degree of distention. When the quantity of pus is small the tubal walls are usually greatly swollen, and the thickness may exceed the normal many fold, whereas in a large, tense pyosalpinx the opposite condition may be noted, just as in a hydrosalpinx. So far as size is concerned a pyosalpinx, as a rule, does not reach that of a hydrosalpinx, although instances are recorded in which an enormous abscess has developed. Inflammatory bands are sometimes developed by which the tube is looped upon itself (Fig. 251).

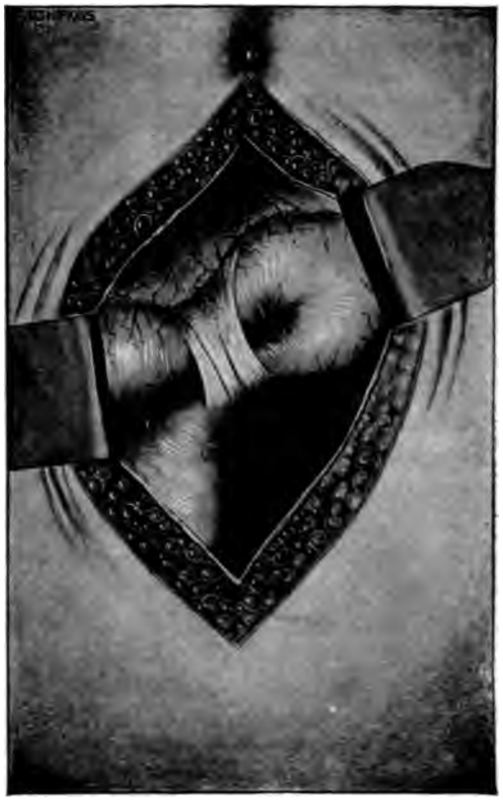


FIG. 251.—DEVELOPMENT OF CONSTRICTING BANDS IN INFECTIOUS SALPINGITIS.

Upon the intensity and chronicity of the inflammatory process also depend the appearance and character of the pyosalpinx, for with the long persistence of the infection there is a steady increase in the amount of connective tissue, which transforms the tube from a flexible to a stiff, resistant condition. Notwithstanding the presence of a very irritating infectious matter, the lining epithelium may remain intact a surprisingly long time; but sooner or later it is completely destroyed in those areas exposed to the contact of the pus, and is supplanted by granulation tissue.

As a result of the direct extension of the inflammation through the wall of the tube, or from local infection of the enveloping peritoneum by escape of the pus from the ostium abdominale, the tube is usually covered with adhesions which bind it to the neighboring organs (Fig. 252). The organization of the adhesions often binds the ovary into an indistinguishable mass with the tube, and in such cases abscesses often form in the spaces between these organs, or between the intestines and tube (perisalpingeal abscess), thus converting the mass into multiple suppurating loculi.

Just as the tuboovarian cyst, described in preceding pages, is formed, so may these cases be converted into tuboovarian abscesses. The ovary, however, notwithstanding its close proximity to the tube, is very often free from infection, there being only a simple perioöphoritis which does not penetrate beyond the tunica albuginea.

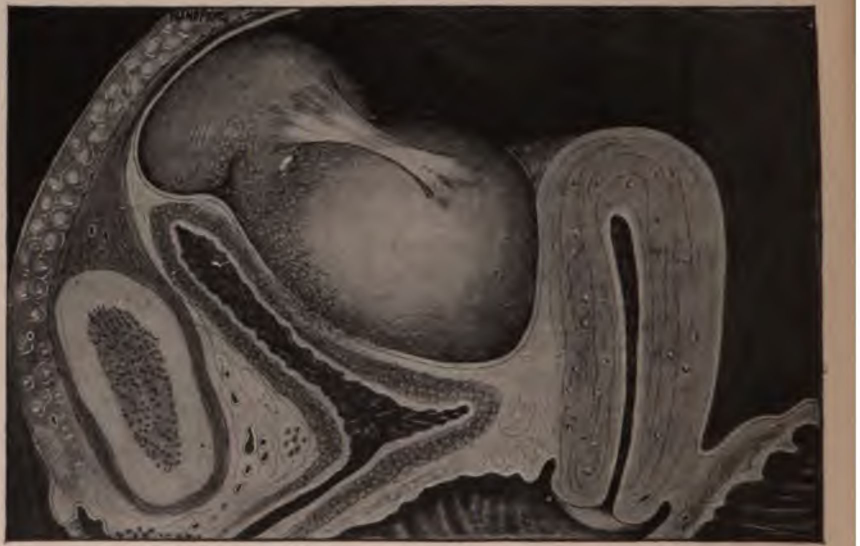


Fig. 252.—How an Infected Tube and Ovary May Become Adherent to Each Other and Nested Between the Uterus and Bladder.

The contents of a pyosalpinx vary in consistence from a thin, yellowish, purulent fluid to a thick, inspissated, cheesy matter, consisting of disorganized pus corpuscles and red blood cells, fibrin, degenerated epithelium, and granular detritus.

As a rule, the culture and microscopic evidence of microorganisms give negative results.

In the earlier stages of the pyosalpinx granulation tissues may take the place of the mucosa, and the underlying tissues become richly infiltrated with round cells; later, however, the granulations are transformed into dense scar tissue. As the inflammatory process becomes chronic the muscular tissue undergoes marked atrophy, until mere traces only may remain. The vessels beneath the peritoneum become thick and tortuous, and sooner or later show hyalin degeneration. In some cases the tubal wall may become quite edematous. Even in simple cases isolated spaces, like those in salpingitis pseudofollicularis, are seen, which are lined by granulation or scar tissue and contain pus. When a typical case of salpingitis pseudofollicularis is converted into a pyosalpinx, cross sections of the tube show an exaggerated loculated appearance. As a result of simple inflammation, or from the deposition of lymph which undergoes organization, the peritoneum may become very greatly thickened. In this way the wall acquires extra retentive power and the distension becomes extreme (Figs. 253, 254).

GONOCOCCUS INFECTION OF THE OVARIES

The inflammation in these cases manifests itself primarily upon the surface of the organ. This is accounted for by the fact that in at least a vast majority of cases, if not in all, infection of the upper genitalia by the gonococcus occurs by the progressive invasion of contiguous mucous surfaces. In this way the infection travels from the vagina through the endometrium, through the tubal mucosa, until it reaches the surface of the ovary. Here it becomes the exciting cause of an inflammation which is manifested more distinctly in the enveloping tunic (perioöphoritis) than in the deep stroma (parenchymatous oöphoritis). Yet a moment's reflection upon the anatomy will show that the division of the inflammation of that organ into superficial and interstitial can not be justified, as neither the cellular nor the circulatory arrangement of the ovary will permit a definite limitation of the inflammation to either one or the other structure. It is, however, a fact of ordinary observation, stoutly affirmed by Reymond, that the gonococcus attacks the surface of the ovary and is never demonstrable in the pus of an ovarian abscess; nor has he ever seen the cyst of an ovary become purulent in consequence of gonorrheal salpingitis. He has, however, observed as the result of gonorrheal contamination of the surface of the ovary peripheral sclerosis and the formation of numerous follicular cysts beneath the sclerotic envelope. It is precisely the development of this sclerosis in the peripheral layer of the ovary that prevents the rupture, and causes the subsequent degeneration, of the gradually maturing Graafian follicles (see Small Cysts of the Ovary).

It must be further stated, however, that, even though the above represents the usual conditions, a transmission of the gonococcus by contiguity and passage through the tissues, and its transfer by the blood and lymphatic vessels, are not only possibilities, but are held by Luther and Wertheim to be frequent. A mixed infection in gonorrhea is

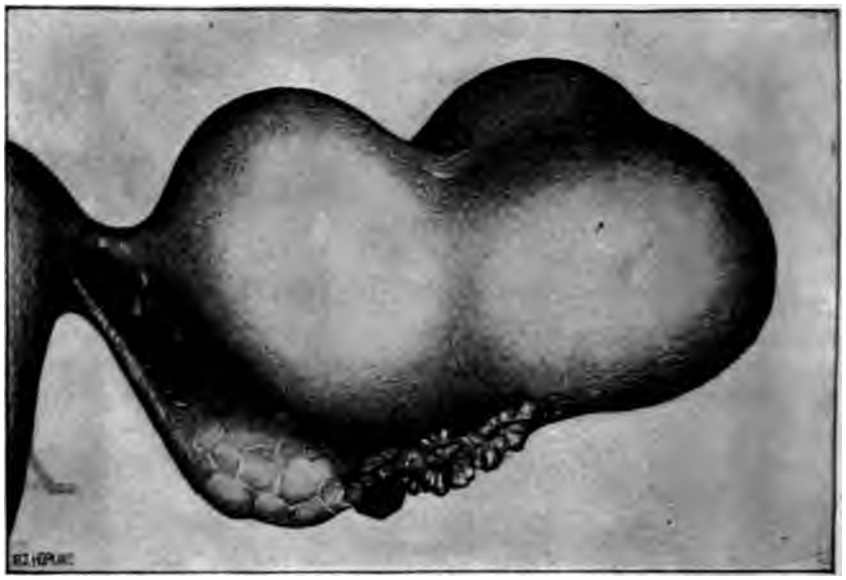


FIG. 253.—HOW AN INFECTED FALLOPIAN TUBE MAY BECOME DISTENDED ALMOST TO THE BURSTING POINT WITHOUT DEVELOPING ADHESIONS (Veit).

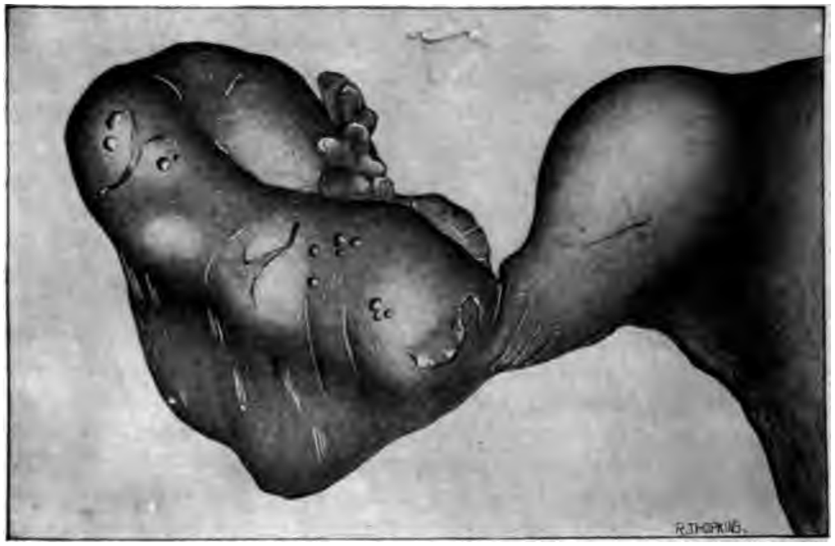


FIG. 254.—DISTENSION OF THE ISTHMUS OF THE TUBE SUGGESTIVE OF OUTWARD EXTENSION OF THE UTERINE CORNU.

perhaps the rule, and any reasoning concerning the course of the transfer must be qualified by this possibility.

The inflammatory reaction of the neighboring peritoneum and the production of adhesions in a gonorrheal inflammation of the ovaries will be very similar in their nature to the processes caused by the streptococcus infection, and will vary with both the intensity of primary infection and the duration of its action.

GONOCOCCUS INFECTION OF THE URETHRA AND BLADDER

The urethra, especially its lower segment, may become infected with gonococci without the disease reaching the bladder. On the other hand, as pure gonococcus infection progresses only by invasion of the mucous surfaces, gonorrheal cystitis never occurs without previous infection of the urethra.

Gonorrheal urethritis in women may be simply marginal, or it may extend into the follicles of Skene, or it may involve the whole urethra. When it extends above the meatus it but rarely stops short of the bladder.

Follicular urethritis or, more properly, gonorrheal folliculitis implies the invasion of the follicles of Skene. These are two blind pockets about 0.5 to 1 cm. in depth and 1 mm. in width, one of which is located on each side of the urethra. Its orifice is just within the meatus and can be readily found with a small probe. These little blind ducts sometimes become the permanent abiding place of gonococcus infection, which can be broken up only by dividing the thin septum between the duct and the urethra.

Gonococcus invasion of the bladder, as already indicated, occurs secondarily to similar infection of the urethra.

It is, however, of importance to remember that, while cases of pure gonococcus infection of the bladder are frequently demonstrated, in the majority of instances they are mixed infections.

To the investigations of Bumm, Clado, Halle and Albarran, Krogius, Escherich, Posner, Lewin, Melchoir, Rovsing, and others is due our knowledge of the bacteriology of cystitis.

Many varieties of bacteria have been found in the bladder. The one most frequently present is the colon bacillus. It reaches the bladder usually from the kidneys with the urine, but may pass directly from the bowel to the bladder when these two organs are connected by inflammatory exudate or adhesions. It may also enter through the urethra. This is most common in very young girls, where, in the presence of acute intestinal disturbances from lack of cleanliness, a vulvar inflammation develops and the infection extends along the urethra to the bladder. As the colon bacillus does not decompose urea the urine remains acid in colon cystitis. The gonococcus almost always enters the bladder through the urethra. This may occur during an acute gonorrhea or during one of the frequent slight exacerbations of a chronic or latent infection.

Many of the cases of cystitis following childbirth originate in the latter manner, favored by the bruised condition of the bladder and urethra incident to the labor. The gonococcus likewise does not decompose urea. Of the ordinary pyogenic microbes the streptococci are more frequently found than the staphylococci. They may reach the bladder on unsterilized instruments or from contiguous suppurating foci, and are frequently found associated with tumors of the bladder, as the epitheliomata, papillomata, etc. The streptococci do not decompose urea, but almost all the staphylococci do. Therefore, in the presence of the latter we find ammoniacal alkaline urine.

The proteus of Hauser has been found a number of times in cystitis. It acts very energetically on urea and the urine is, therefore, strongly ammoniacal. The prognosis in infection by the proteus of Hauser is unfavorable, as 3 out of 4 subjects seen by Melchoir died. Krogius saw 2 subjects, both of whom died.

The tubercle bacillus is a common cause of chronic cystitis and usually infects the bladder from a tuberculous focus in the kidney. The urine in tuberculous cystitis remains acid. Other bacteria have occasionally been found in cystitis, but not with sufficient frequency to demand special mention.

The changes induced in the wall of the bladder cannot be said to be characteristic of gonococcus infection. As pointed out by M. L. Harris, the pathologic changes are much the same regardless of the particular kind of microbe present, with the exception of the tubercle bacillus, which alone produces somewhat characteristic changes. Marked differences, however, exist in degree. The same variety of microbe may at one time produce the most extensive changes, and at another time almost none, for reasons that can not better be expressed than by the terms "varying virulence" on the part of the microbes and "power of resistance" on the part of the bladder. The changes produced are hyperemia with swelling and infiltration. These may be circumscribed or diffuse. In the former case they may be limited to a small area about the inner orifice of the urethra, to the trigone, or to a small area about one or the other ureteral orifice. In severe cases the mucosa is considerably swollen and thrown into folds. It is soft, often edematous, and small hemorrhages are not infrequent. Erosions may occur, particularly on the folds. Papillomatous elevations which are soft and bleed easily on touch may form. Inflamed areas may become covered by a grayish or yellowish membrane-like substance composed of pus cells, mucus, bacteria, detached epithelial cells, etc., in which phosphates may be deposited, and which may adhere quite intimately to the mucosa. The changes may extend to the submucosa and muscularis, where abscesses may form that may rupture into the bladder or into the pericystic tissues. The inflammatory changes may extend through the entire wall of the bladder, producing a pericystitis. In chronic cases the muscularis becomes greatly hypertrophied, the walls much thickened, and the capacity of the organ markedly reduced. In a particularly virulent infection following childbirth, or some of the acute infectious diseases, the mucosa may slough. A diphtheritic cystitis may likewise occur. In tuberculous cystitis the changes are usually circumscribed and appear first about the ureteral orifices. Small, slightly elevated tubercles may be seen, which undergo caseation and softening, and break down, forming small ulcers. There may be but a single ulcer or they may be multiple.

GONOCOCCUS INFECTION OF THE KIDNEY

Gonococcus infection, with its tendency to migrate by progressive invasion of mucous surfaces, not infrequently reaches the bladder, but much less frequently reaches the kidneys. Bockhardt, reported by Neuendorff, injected a pure culture of gonococci into the healthy urethra of a man with paralytic dementia. At autopsy a few days later a perinephritic abscess was found to contain gonococci. Asahara reports several cases of mixed infection of the kidney and one of pure gonococcus infection. T. R. Hagner, H. H. Young, Marcase Seilei, Unterberg, and Weisswange have reportted very interesting cases. One by Bransford Lewis was demonstrated to have had three ureters which, on catheterization, yielded three different urines, that from one kidney alone showing gonococcus infection.

Like all other infections, that of the kidney is but rarely pure, although in practically all cases in which it occurs at all the gonococcus exercises a predominating influence in the clinical manifestations, and is almost uniformly the demonstrable etiologic factor. The colon bacillus, the staphylococcus, streptococcus, pneumococcus, typhoid, and *Proteus vulgaris* are other organisms that have been demonstrated in these cases. Each frequently fails to show active symptoms in the presence of most aggravated disease due to the gonococcus.

GONOCOCCUS INFECTION OF THE RECTUM

Gonorrhea of the rectum is of occasional occurrence. It is caused by infection of the rectum with the gonococcus of Neisser, although as ordinarily found it is here, as elsewhere, a mixed infection. It is generally caused by an associated attack of gonorrhea infecting primarily the genitourinary apparatus. The discharge, which is generally copious in the acute stages, may bathe the perineum or invade the anal folds, from which it gains ready access to the mucous surfaces above the anal constriction. In other instances, and perhaps in the majority of all instances, the infection occurs as the result of using for the purpose of a rectal injection a syringe nozzle which has been employed in an infected vagina. The disease may result from perverted sexual indulgences.

The *pathology* is essentially that of an acute inflammation depending for its occurrence primarily upon the specific coccus of Neisser. The action of this microorganism on the rectal mucous membrane is very virulent and results speedily in the destruction of at least limited areas of rectal epithelium, resulting in the development of granular patches which are ordinarily designated ulcerations. The mucous follicles are invaded, resulting in their stimulation to catarrhal activity. If the epithelium of the efferent ducts is destroyed they may become occluded, resulting in the development of retention cysts. The majority of the follicles, however, undergo hypertrophy and become more or less persistently catarrhal. In the presence of an infection atrium the microorganisms penetrate the deeper structures and may cause ischiorectal abscesses; or they may invade the lymph spaces, causing enlargement of the pelvic lymphatics, or even resulting in some cases in suppuration. The infection may, by traversing the lymph channels, reach the peritoneum, causing septic inflammation of that membrane. When the inflammation has been so intense as to cause extensive epithelial destruction post-inflammatory contractions resulting in stricture may supervene.

SYMPTOMS AND DIAGNOSIS OF GONOCOCCUS INFECTION

It is of the highest importance that the examining surgeon shall have firmly fixed in his mind a few cardinal facts with reference to gonorrhea in women, viz.:

First, the disease is always primarily local, involving the vagina, vulva, and meatus urinarius.

Second, the disease extends by progressive invasion of mucous surfaces and may in this way come to involve the vulva, vagina, uterus, Fallopian tubes, ovaries, urethra, bladder, and kidneys.

Third, any manipulation in the course of examination that may carry the gonococcus from a present point of infection to a point not already infected is to be most carefully avoided.

Fourth, the disease may persist in a latent form after all active symptoms have disappeared, and while in that form may be communicated in all its original virulency.

The best understanding of the disease is secured by considering its symptoms (a) in connection with the different organs and structures, and (b) in connection with its latent form.

Gonococcus Infections of the Vulva and Vagina.—The first thing to attract attention is a sudden and rapidly increasing discharge from the vagina. This discharge differs from the ordinary leukorrheal discharge in that it is first light yellow, rapidly changing to a deeper yellow and even a greenish color. Almost coincident with the onset of this discharge is a sense of burning about the ostium vaginæ and the orifice of the urethra. On infection, a few days after the onset of the discharge, the hair will be found matted and the vulval structures bathed with the purulent secretion. On separating the vulval lips the proximal cutaneous surfaces, and especially the bottom of the interlabial folds, will show areas of acute dermatitis, if not actual excoriations (vulvitis). The margins of the urethra and the carunculæ myrtiformes are red and so far denuded of epithelium that in certain cases drops of blood will exude on the slightest touch. Tenderness in the urethra and pain in the bladder, with frequent desire to urinate, and with a mucopurulent sediment in the urine, are present when the acute process extends up the urinary tract. Further exploration will show that the vaginal wall is weeping a purulent discharge, which diminishes in volume and purulence the nearer the uterus is approached. In some cases, however, in which the process is further advanced, the cervix is found bathed with the same character of secretion, and, in still others, a yellowish discharge is seen exuding from the cervical canal. In still other cases pain is complained of in either or both iliac regions, and bimanual examination will reveal tenderness to touch and tumefaction above either fornix of the vagina, indicating involvement of the uterine adnexa. When the inflammatory process is once communicated to the ovaries the pain and tenderness often become the most excruciating possible, causing the patient to shriek in agony, and demanding narcotics, and at times even anesthesia, for its relief.

The positive diagnosis, even in the presence of these almost characteristic symptoms, can be predicated only upon the demonstration of the gonococcus in the secretion. This is best done by the Gram method. In view not only of the clinical and pathological significance, but of the medicolegal and sociological possibilities of many of them, this examination ought to be made before the attendant commits himself to a diagnosis. To do this a smear of the discharge is dried on a glass slide and stained in the usual way by the usual pigments of anilin. This will reveal the gonococci, if present. The demonstration is then confirmed by decolorizing the gonococci by the Gram method. Or a culture can be made by using one part human blood serum and two parts agar (Wertheim's medium).

Gonococcus Infection of the Vulvovaginal Glands.—The symptoms of gonococcus infection vary according to the extent of the invasion, that is to say, according as it may be restricted to the ostia or to the ducts, or if it has invaded the glands.

When yet restricted to the ducts it gives rise to few or no symptoms, so that the patient may be totally unconscious of its presence. Occasionally there is a sensation of itching and burning, and perhaps some slight sensitiveness on pressure, or the patient may complain of a dull pain, increased on walking or sitting.

These symptoms, when they occur, are of short duration, and the patient may be conscious of nothing more than a slight mucopurulent discharge. Even this is often so slight as to escape notice.

On examination, if the labia are separated so as to bring the mouth of the ducts into view, these appear, in cases of recent infection, in the form of dark red, glistening, moist spots resembling small ulcers, this appearance being due to ectropion of the inflamed and swollen mucous membrane lining the duct.

If pressure is made along the course of the duct a thin yellowish pus may be made to exude from its mouth, often in considerable quantities, which examination with the microscope shows to consist of pus and desquamated epithelial cells, in which gonococci may be demonstrated in large numbers.

Occasionally a nodular swelling or induration, due to an infiltration of the subepithelial connective tissue by small round cells, may be felt along the course of the duct.

When the disease becomes chronic similar signs may be observed, though less pronounced. The secretion now becomes more mucoid in character, and, while gonococci may still be demonstrated, they are present in diminished numbers.

Frequently the only remaining sign of infection is the appearance of the mouths of the ducts, which Sänger has compared with flea bites and has named "maculæ gonorrhœæ" since he regards them as an infallible sign of gonorrhea.

Gonorrheal inflammation of the ducts may terminate in abscess of the glands or in cyst formation.

Abscess of the vulvovaginal gland, as a rule, begins abruptly and manifests itself by swelling of the labia majora, accompanied by the usual signs of acute inflammation—redness, heat, and pain. On examination there may be felt in the posterior third of the labia majora, and often extending into the vagina, an irregular shaped swelling the size of a pigeon's egg, and extremely sensitive on pressure. After a few days, during which the symptoms increase in severity, the swelling becomes boggy, indicating beginning suppuration, and fluctuation may soon be felt. During this time the patient will usually find locomotion difficult on account of the swelling. The pain will have increased in severity, and have become throbbing in character. In severe cases there is usually a slight elevation of temperature, reaching 101° or 102° F., and the onset of suppuration may be ushered in by a chill. There is usually some swelling of the inguinal glands on the affected side, which always indicates infection by other pyogenic bacteria, as it is never present in pure gonorrheal infection (Sänger). With the accumulation of pus a gradual thinning of the skin and subcutaneous tissue takes place, and the abscess, if not opened, points and ruptures spontaneously.

Perforation usually takes place on the inner surface of the labia majora, but the pus may be conducted forward between the layers of the ischiopubic fascia, and point in the fold between the labia majora and labia minora. In some cases the abscess may be evacuated through the duct by pressure made in that direction; but this is exceptional, as the duct is usually occluded, or at least does not communicate with the main abscess cavity. Rarely the pus may burrow, and the abscess may be evacuated through the perineum, or even into the rectum, with resulting fistulæ. The pus may be yellow, dirty green, or chocolate colored from altered blood. It frequently has a foul odor and may contain gangrenous shreds.

Well-defined abscesses are usually sharply limited by a thick pyogenic membrane, the inner surface of which may be smooth or irregular from necrotic shreds, or from trabeculæ-like septa which separate the lobes of the gland. Inflammation of the vulvovaginal gland almost invariably terminates in suppuration, though occasionally cases are met with in which it is characterized by marked induration, with little tendency to the accumulation of pus. In these cases the induration may remain for a long time, and may serve as a focus of infection for renewed attacks under the stimulus of traumatism.

Gonococcus Infection of the Fallopian Tubes (*Salpingitis*).—The symptoms of gonococcus infection of the Fallopian tubes vary according to (a) the virulence of the infection, (b) the resistance of the patient, (c) the character of the induced pathologic changes in the tubes themselves, and (d) the character of the induced and associated pathologic changes in neighboring organs and structures, such as the ovaries and peritoneum.

The history of the case is of first importance. The occurrence of antecedent infection of the vagina, or urethra, with an intervening period of a few weeks to a few months, is practically conclusive, and interrogatories should be addressed directly or indirectly to determine not only the fact of exposure, but the possibility of a pending acute attack.

Pain complained of is generally referred to one or the other, or both, iliac regions; in certain cases a distinct sacralgia is complained of; in others the pain radiates down the thighs, corresponding to the distribution of the sacral plexus of nerves; while in still others the greatest intensity is referred to the rectum and perineal region. Vesical pain, spasmodic in character, is sometimes complained of. The pain, wherever experienced with greatest intensity, is more or less constant and is variously described by patients as "burning," "cutting," "darting," and occasionally as "cramps." In practically all cases, but especially in those in which the ovaries have become involved, the pain is greatest just preceding the onset and during the first day of the menstrual flow. In cases of long standing, with adhesions involving practically all of the pelvic viscera, there is frequently a marked recrudescence of pain in the mid-period, the so-called *intermenstrual pain.*

Digital touch *per vaginam* is generally all that is required to distinguish the presence of tumefaction with associated tenderness. Bimanual examination generally confirms and renders more definite the information derived by mere vaginal touch. Care should be taken in this manipulation, as it is easy by pressure not only to inflict unnecessary pain, but to break down newly formed adhesions at the fimbriæ, and thus permit the tubal content to escape into the peritoneal cavity. I have shuddered at the rudeness and crudeness—the wholly unnecessary and cruel painfulness—with which this examination has been made by practitioners who, by that fact alone, demonstrated that they ought not to be practitioners. This examination ought to be made with the patient on her back, her shoulders slightly elevated, the thighs well but not extremely flexed upon the abdomen, and with the heels brought well together. This posture secures the best relaxation of the abdominal muscles, the rigidity of which is always relative to the intensity of the underlying inflammation, and it likewise secures the separation of the knees, which further facilitates the manipulation. In many cases the examination cannot be satisfactorily made without anesthesia, under which additional care must be taken to avoid damage from the application of too much force.

In arriving at a diagnosis of the intrapelvic condition it is important to remember that salpingitis with associated ovaritis, especially after the acute stage has passed, may be confused with such conditions as (a) ovarian tumor, (b) small pedunculated fibroids, (c) extrauterine pregnancy, (d) fecal accumulations, (e) uterine displacements, (f) hematoma, and last, but not least, (g) appendicitis.

(a) An *ovarian tumor* is generally insidious and, unless dermoid, painless in its development; it is ordinarily not discovered until it is larger than an infected tube usually becomes; it is generally spherical and movable, and its manipulation does not cause pain on pressure, and it is generally located only upon one side.

(b) A *fibroid* occupying one side or the other of the pelvis is generally pedunculated, always subserous, always more movable, less tender, and more spherical than an involved appendage. Ordinarily the movement of the tumor involves corresponding movement of the uterus.

(c) An *extrauterine pregnancy* is generally unsuspected until rupture, when sudden pain in the pelvis with shock and the symptoms of internal hemorrhage are the first to call attention to the condition. It will then generally be found that the normal menstruation has been confused with a more or less shreddy, dribbling, sanguineous discharge from the uterus during the preceding four to eight or ten weeks. The diagnosis should be settled by immediate exploratory incision.

(d) A *fecal accumulation* generally takes place in the left side, in the lower zone of the sigmoid, and occurs as a spherical mass that can be dented by a little pressure. This condition may exist in the presence of perfect regularity of the bowels. It often occurs as a complication of enteroptosis. The diagnosis can generally be cleared up by exploration of the rectum with the finger.

(e) A *displaced uterus,* especially in state of lateroversion, is but rarely so bound down by adhesions that its exact nature can be made out by bimanual manipulation.

(f) A *pelvic hematoma,* by which is meant a rupture of a vein in the pampiniform plexus and a large intra- or extra-peritoneal extravasation of blood, comes on suddenly with symptoms that confuse the condition with extrauterine pregnancy rather than with any other condition. The diagnosis of this condition, like that of ruptured extrauterine pregnancy, should be cleared up by exploratory incision, undertaken without a moment's unnecessary delay.

(g) *Appendicitis* may be a source of confusion, especially if recurrent, and in cases in which the appendix has become fixed at or below the brim of the true pelvis, or in other cases in which that structure is carried far down by a general coloptosis involving the cecum. In each case there are sudden recrudescences of pain, with tenderness on the right lower quadrant, with temperature that may run from 100° to 103.5° F. In appendicitis the pain is always referred to McBurney's point, but McBurney's point may vary in location according to the mobility of the cecum. The only way accurately and safely to differentiate between a pus tube in the right side and an appendicitis is by surgical exploration. Many lives have been lost by trifling away time with less decisive expedients.

The attempt to distinguish between pyosalpinx, hydrosalpinx, and hematosalpinx, while an entertaining exercise in refined diagnostics, is but rarely justified by the practical exigencies of the case. With the history of an acute attack, recent or remote, with the subjective and objective symptoms already associated with a history of a more or less pronounced septic curve in temperature, or with crises resulting in and relieved by purulent discharge either from the vagina or rectum pyosalpinx may be predicated. In the presence of a similar history with repeated crises of pain and tenderness that suddenly disappear, with or without watery discharge from the vagina, hydrosalpinx may be diagnosed. There are no positive symptoms by which the presence of more or less blood in the tube may be determined. If a differential diagnosis must be made—and I cannot imagine the conditions that would make it imperative—a slender aspirating needle may be inserted through the vault of the vagina, and even then only positive results are valuable, the failure to get fluid being no evidence of the absence of infection. The only rational way to settle all these details, relatively of only slight importance, is by exploratory incision. This is even true with respect to pelvic abscess, which sometimes, but rarely, results from rupture of a gonorrheal tube with a retrouterine accumulation of pus. This condition will be discussed in connection with staphylococcus infection (q. v.).

Gonococcus Infection of the Ovaries.—Gonorrheal infection of the ovaries is one of the most painful of affections. It is generally preceded by a history of progressive invasion from below. I have seen two cases in which acute infection of the ovaries occurred less than two weeks following initial infection of the vagina. In these acute cases the symptoms are necessarily confused with those relating to the tubes. The fact that the pain has become suddenly more intense and that it has become located more definitely in the ovarian regions, one or both, is indicative that the infection has reached those organs. These cases may become chronic. By this is meant that the microorganisms have disappeared from the surface of the ovary, but that the periovarian exudate induced by them has become organized either in the form of an adventitious tunic or as bands of adhesions by which the ovaries are more or less firmly adherent to other structures. Pain in these cases is always persistent, getting worse with years, and always showing recrudescences when the ovary is expanded by the premenstrual congestion, and when it shrinks by recedence of the menstrual wave. In the one instance the pain is from a pinch; in the other from a pull.

Gonococcus Infection of the Urethra.—Gonococcus infection of the urethra, when acute, is characterized by a burning pain on urination. This is first experienced at the meatus, but may later extend up the canal. If the case is inspected during the acute stage, and a few days after the onset of the disease, the margins of the meatus will be found inflamed and everted. In many cases there may be distinct excoriations with minute ecchymoses. A drop or two of pus can generally be found at the meatus. It should be remembered, however, that acute gonorrheal urethritis in women never exists without similar infection of the vulva and lower vagina, and that the discharge present at the meatus at the time of examination may be derived from neighboring structures.

A catheter or sound must never be introduced in these cases, as it is liable to carry the infection into the bladder, which might otherwise escape.

When the condition reaches the stage of decline, often two or three weeks, or when it later becomes chronic the pain may entirely cease and the redness and excoriation disappear. This, however, does not imply that the infection is at an end, but that it may simply have passed into the chronic or latent form (q. v.).

Gonorrheal Infection of the Bladder.—The symptoms of gonorrheal infection of the bladder are not different from those of cystitis from other infections, except possibly that by the *Bacillus tuberculosis.* They relate to (a) the sensibility of the bladder, (b) the condition of the urine, and (c) the appearance of the bladder wall on cystoscopic inspection.

(a) The sensibility of the bladder becomes more acute than normal. The cystitis manifests itself by painful, frequent urination and changes in the character of the urine. The severity of the symptoms varies greatly. In acute cystitis the desire to urinate is very urgent and the pain accompanying the act quite marked. The increased sensitiveness of the mucosa impels the patient to evacuate the bladder so soon as a small amount of urine accumulates within it, and the contraction of the muscle incident thereto is the chief cause of pain. In severe cases it is necessary to urinate frequently, sometimes as often as every few minutes day and night; and, as the relief obtained is often slight or of short duration, the patient is almost constantly tormented and thus deprived of much needed rest and sleep. In milder cases urination may be necessary only every hour or two during the day and two or three times at night. The pain is felt deep in the lower part of the abdomen or behind the symphysis pubis. It is often of a burning or smarting character, and may extend along the urethra to the meatus. The bladder by bimanual palpation or even by vaginal touch is found [illegible] mark [illegible]

[illegible] an [illegible] exudate [illegible]

[illegible] appearance [illegible] circular oval or [illegible] of varying degree. [illegible] The mucosa may [illegible] infiltrations [illegible] formation of small ves- [illegible]

[illegible] *Infection of the Kidney.* [illegible] affection of the [illegible] gonorrhea, necessarily with previous infection of the bladder. Its presumptive diagnosis is, therefore, largely dependent upon the previous history of the case. Pain in the region of the kidney, chill followed by elevation of the temperature, and general hebetude mark the initial stages. Later the temperature continues to go above normal at irregular intervals, but the extremes of vacillation are less marked. The urine becomes cloudy. The centrifuged sediment from a catheterized specimen shows the presence of gonococci. Cystoscopic examination will now probably show which ureter yields the cloudy urine. If it does catheterization of that ureter may be safely undertaken to confirm the diagnosis, provided that the ureter thus indicated is in the side on which the patient locates her symptoms. The obviously non-infected ureter in these cases ought under no circumstances to be catheterized, as such manipulation will carry the infection into a healthy kidney. The demonstration of the gonococci in the urine taken by ureteral catheterization establishes the diagnosis (see Catheterization of the Ureters under Methods of Examination and Diagnosis). In this connection it is important not to be confused by the statement of Dowd, who insists that infection of the kidneys may result from migration through the lymph channels without progressive invasion of the mucous membrane. The apparent exemption of the bladder in ascending infection is found in the resistance of the bladder itself.

Gonococcus Infection of the Rectum.—The symptoms of gonorrhea of the rectum consist in pain associated with burning and tenesmus in the earlier acute stages; there is also a copious mucopurulent secretion which is discharged at frequent intervals. The diagnosis depends upon the demonstration by means of the microscope of the gonococcus of Neisser.

LATENT FORM

The preceding symptoms, after a period of from one to six weeks, may recede in severity or even apparently disappear. At this juncture the case, if it has been seen early and given proper treatment, may be cured; in other instances, however early or late it may have been seen, or whatever treatment it may have received, the disease passes into the latent form. This means that the active agent, the gonococcus, has taken up its habitat in any or all of the lurking places already enumerated.

The diagnosis of this condition is obviously fraught with extreme importance, especially in view of complications ensuing out of marital relations, present or prospective, or even growing out of sexual intercourse of the illicit sort. The examination should be most thorough and systematic. A strong presumption of gonorrhea may be based upon the history of an acute attack, such as outlined in the preceding parabe remembered in this connection, however, that in latent gonorrhea the gonococcus, while the active and determining agent, is rarely if ever found alone. On the contrary, the infection has practically always become mixed at this stage of the disease, both staphylococci and streptococci abounding in the field. This fact does not, however, in the least destroy the positive character of the diagnosis in the presence of the gonococcus. Oskar Bodenstein quotes Sänger to the effect that the local application of a 50 per cent. solution of zinc chlorid will cause the granules in the vaginal mucous membrane to spring into relief in chronic gonorrhea—a convenient diagnostic expedient that is certainly worthy of investigation.

PROGNOSIS OF GONOCOCCUS INFECTION

The prognosis depends upon the virulence of the infection, the stage of the disease, the structures involved, and the character of the pathological changes. An acute gonorrhea, taken within the first few days of the onset, one that has not been tampered with by injudicious treatment, ought to be cured in from two to three weeks. If the infection has invaded either the vulvovaginal glands or Skene's ducts, or any of the remoter mucous tracts, especially if it has reached the Fallopian tubes, no promise can be made, even of a symptomatic cure, without surgical interference. These remoter complications are the causes of more chronic and even permanent invalidism among women than all other causes combined.

TREATMENT OF GONOCOCCUS INFECTION

The treatment of gonorrhea in women is both *medical* and *surgical,* and varies in both instances according to the structures involved, and the extent and character of the pathologic process presenting at the time.

Medical Treatment.—This is local and essentially antiseptic in character. Two objects are to be held distinctly in view. One is to destroy the infection, and the other is to prevent its extension. In the application of these principles the last comes first in the following plan of treatment; in acute cases, while the infection is yet limited to the uterus, the cervix should be carefully exposed and any secretion cautiously but thoroughly wiped from its surface. The cervical canal is then gently but firmly packed with a ribbon of gauze, saturated with a five per cent. solution of protargol. The end of this gauze has a silkworm gut attached to it and left long, so that the gauze, which is packed entirely within the cervical canal, can be readily removed.

The speculum is then taken away and copious tepid douches are at once given. The formula which I have found to be an excellent detergent is as follows:

℞	Sodii chlorid.	half ounce.
	Sodii bicarb.	half ounce.
	Aquæ	one gallon.

M.

This should be given by means of a fountain syringe hung high to give the maximum of pressure. The water should be permitted to flow freely into the vagina, but it should be kept from running out until the vagina is thoroughly distended. This will flatten out the rugæ and permit the fluid to come in contact with all parts of the mucous surface. The vulval pressure should then be suddenly released, when the fluid will come out with a gush. This should be repeated several times at the same sitting, until the whole gallon of water is used. Following this a half gallon of solution of mercuric bichlorid, one to three thousand, should be used in the same way at intervals of a few minutes for a period of half an hour. At the end of this time, the cervical packing being left *in situ,* the vagina is packed with a long slender tampon of lamb's wool, saturated with a five per cent. solution of protargol in glycerin. This treatment should be repeated twice daily for two days, and once a day thereafter until the infection disappears. I have had the gonococci disappear absolutely under this treatment within five days, although ordinarily a day or two longer is required to secure that result.

If there is reason to believe that the disease has already extended into the uterus the protargol pack, used for prophylactic purposes in the non-infected cervix, should be carried for curative purpose to the fundus, and left *in situ* for twenty-four hours at a time. To accomplish this the cervix may be gently divulsed, care being taken not to wound the mucosa. Tents ought never to be employed, and curettage ought never to be practiced in the presence of acute infection.

If the infection has invaded the urethra the condition should be treated by injections of protargol, one per cent. in water, the same as in men. If the disease has gone even higher, causing a cystitis, a half ounce of similar protargol solution may be thrown directly into the bladder after the latter has been washed out. The protargol itself can then be washed out, after it has been permitted to remain in for from twenty minutes to half an hour. Alkaline diuretics, such as potassium acetate in abundant water, should be given almost *ad libitum* until proper reaction is secured.

If the Fallopian tubes or ovaries, or both, are involved, and if the pain, tenderness, and tumefaction are pronounced, the patient should be treated by rest in bed, with ice packs kept permanently over the lower abdomen. Gentle laxatives should be given. The exosmosis induced by salines makes them especially eligible. Tampons with glycerin as the essential medicament are of value for purposes of local elimination, but in applying them extreme care should be taken to avoid manipulation of the acutely inflamed appendages. Opiates may be required to control extreme pain. This treatment, with such variations as may be indicated in the individual case, should be continued either until the active symptoms have subsided, or until after several days it has been demonstrated that they cannot thus be brought under control. In either event the case is ready for surgical treatment.

Surgical Treatment.—This is directed at the pathologic consequences of gonorrhea rather than at the infection itself. *Condylomata accuminata* should be removed by cutting them away and treating each base with the actual cautery. The *vulvovaginal glands,* when infected, may become the seats of suppuration. This should be met by free incision, which should not be practiced until the abscess is well formed. The object in this delay is to secure the suppuration of as much of the gland tissue as possible, or all of it, if possible, and thus avoid subsequent trouble. When there is some residual infection after drainage there may be recrudescence. If this should occur the gland should be completely extirpated.

In the presence of chronic endometritis following active infection curettage, with careful antiseptic packing of the cavity, should be practiced. If the Fallopian tubes have become involved, and if, in spite of treatment as previously outlined, they should be the source of serious and progressive symptoms, local or constitutional, they should be removed without delay. It should be remembered, however, that operation at this time is fraught with more danger than later, when, owing to the autosterilization of the pus, the disease may be said to be more quiescent. When this stage is reached the accumulation of pus may be considerable, and, being located low down in the pelvis, it may be readily reached by simple puncture through the vault of the vagina. This ought not to be practiced unless the mass is distinctly fluctuating, and it ought then to be confined to the presenting part and not utilized for even more extensive exploration. The only object at this time is to eliminate the pus from the field of a subsequent radical operation, although in a number of cases symptomatic cure has followed this puncture and drainage treatment. In a certain number of cases a *pelvic abscess,* entirely extratubal, may develop, presenting at or above the brim of the pelvis. This ought to be treated as a preliminary step, and is generally best done by opening along Poupart's ligament, lifting up the peritoneal fold, and carrying the drainage through into the vault of the vagina. In all cases in which there is a persistence of symptoms of tubal origin following preliminary treatment such as outlined, and following surgical expedients already described in cases in which they are indicated, chronic salpingitis with occlusion may be predicated, and an abdominal exploration is indicated. This means that, as a rule, the affected appendages should be removed. In certain cases in which the tubal contents are serous, in which the histological changes in tube are not necessarily destructive of its functional capacity, and in which similarly destructive changes have not taken place in the corresponding ovary, conservative operation may be undertaken. These operations are sometimes, although not frequently, successful, and the surgeon owes it to himself and to his patient to make this point entirely clear. The possibility of reproduction is often, however, of such importance that patients voluntarily take the risk of failure and of another operation for final relief. In *chronic cystitis* of *gonorrheal origin* it is sometimes necessary to open, curette, or rather wipe away the granulations and drain. *Pyonephrosis* as a sequel to gonorrhea generally requires drainage, sometimes with removal of calculi, necessitating the operation of nephrotomy.

PUNCTURE AND DRAINAGE

112. PROCEDURE FOR THE EVACUATION OF PUS FROM THE PELVIS (VAGINAL ROUTE)

(1) The patient is placed in the dorsal position with the thighs well flexed.

(2) The index finger of the left hand is introduced into the vagina and is carried up to the retrouterine mass presenting in the cul-de-sac.

(3) With the intravaginal finger as a guide a sharp-pointed divulsor (Figs. 255-255a), or, less preferably, a sharp-pointed scissors curved on the flat, is plunged through the vaginal vault into the cavity of suppuration, and the instrument spread far enough to make an opening into which the finger can be introduced.

(4) If a second fluctuating mass is felt it should be punctured through the same opening.

(5) Drainage should be maintained preferably by introducing a self-retaining soft rubber T tube made as indicated in Figs. 256, 257. If this or a similar tube is not available a loose strand of gauze is fed into the cavity, leaving one end free in the vagina (Fig. 258).

If the cavity has been freely opened and kept open it will drain spontaneously without other than vaginal irrigations. It is not advisable to wash out the cavity itself, as the protective adhesions above may give way and the peritoneal cavity thus become contaminated. The drainage should be kept up as long as it is purulent, after which the opening closes spontaneously.

The cases which are best adapted to this method of drainage are those in which the purulent accumulation lies behind the uterus in the cul-de-sac, or behind the posterior folds of the broad ligament upon either side, or in which the suppuration has occurred primarily in the lymphatics of the pelvis and has burrowed thence posteriorly or laterally round the uterus and the upper portion of the vagina. In such cases the products of suppuration can be most easily removed through the vagina. The operation is done in various ways. The patient should in all instances be carefully prepared. Some operators prefer to place the patient in a recumbent posture, with her knees flexed well upon her thorax, the extreme Simon position, and, inserting a perineal retractor, to locate the most dependent portion of the purulent sac or cavity, which is then opened with a bistoury. This is far from being a safe method of procedure, for the reason that in practically all these cases there is more or less distortion of the tissues and consequent displacement of the blood vessels. A free incision, therefore, in a locality which under normal conditions will be entirely safe, may result in these cases in the division of the blood vessels and a consequent serious and often fatal hemorrhage. It is better, therefore, to adopt the method described many years ago by Clinton Cushing and to make this opening by means of a dilating plunger.

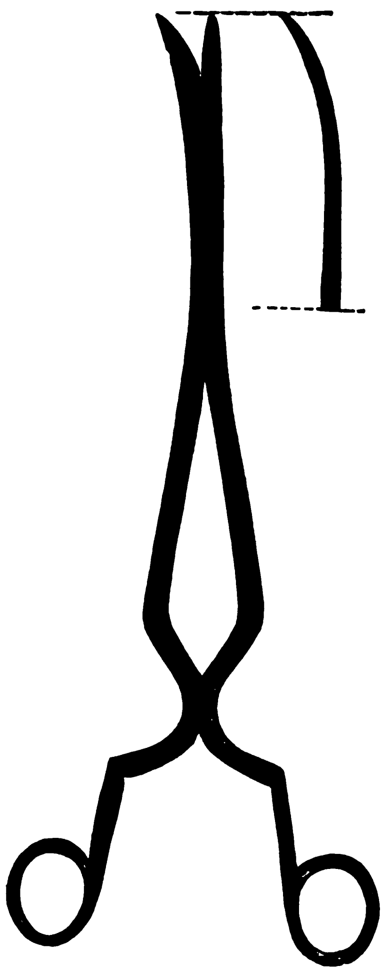


FIG. 255.—(112) PROCEDURE FOR VAGINAL PUNCTURE OF PELVIC ABSCESS. (a) A sharp-pointed, curved dilator used for vaginal puncture of pelvic abscess.

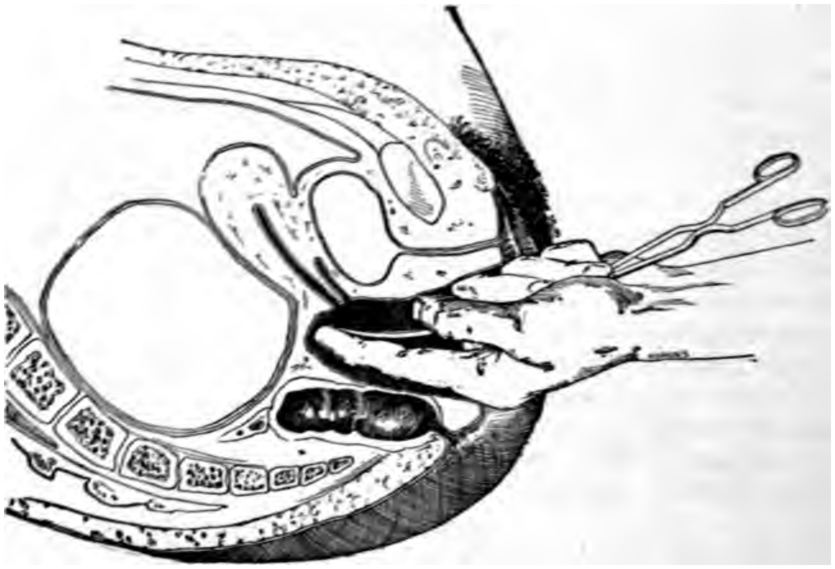


Fig. 255a.—(112) Procedure for Vaginal Puncture of Pelvic Abscess. (b) Method of using dilator, with index finger acting as guide.

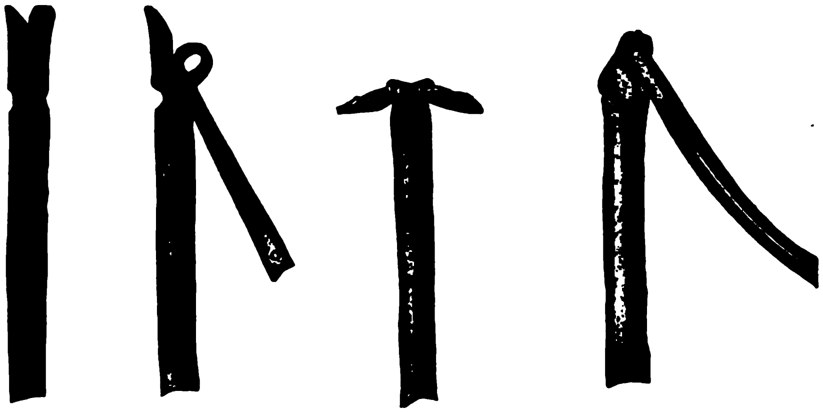


Fig. 256.—(112) Procedure for Vaginal Puncture of Pelvic Abscess. (c) A conveniently made self-retaining T-drainage tube.

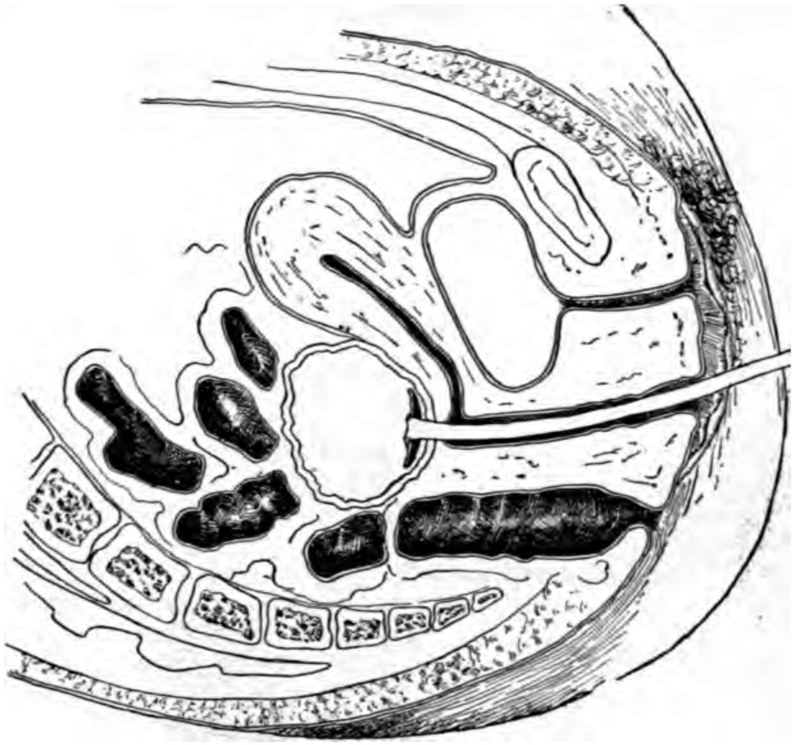


FIG. 257.—(112) PROCEDURE FOR VAGINAL PUNCTURE OF PELVIC ABSCESS. (d) T-drainage tube inserted.

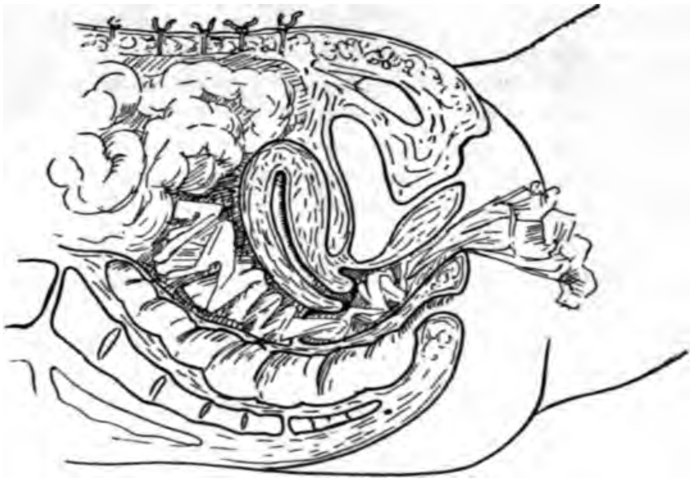


FIG. 258.—GAUZE DRAINAGE OF THE PELVIS THROUGH ABDOMINAL INCISION.

112a. PROCEDURE FOR THROUGH-AND-THROUGH DRAINAGE OF PUS FROM THE PELVIS BY THE EXTRAPERITONEAL ROUTE

(1) An incision about 6 cm. long is made just above and along the line of Poupart's ligament.

(2) When the peritoneum is reached it is not cut through, but gently elevated from the pelvic wall by either the handle of a knife, the glove finger, or a piece of gauze.

(3) This dissection is continued until the pus deposit is reached and evacuated.

(4) The finger still within the pus cavity is used as a guide to direct the pointed divulsor against the index finger of the other hand, which has been introduced into the vagina also to act as a guide.

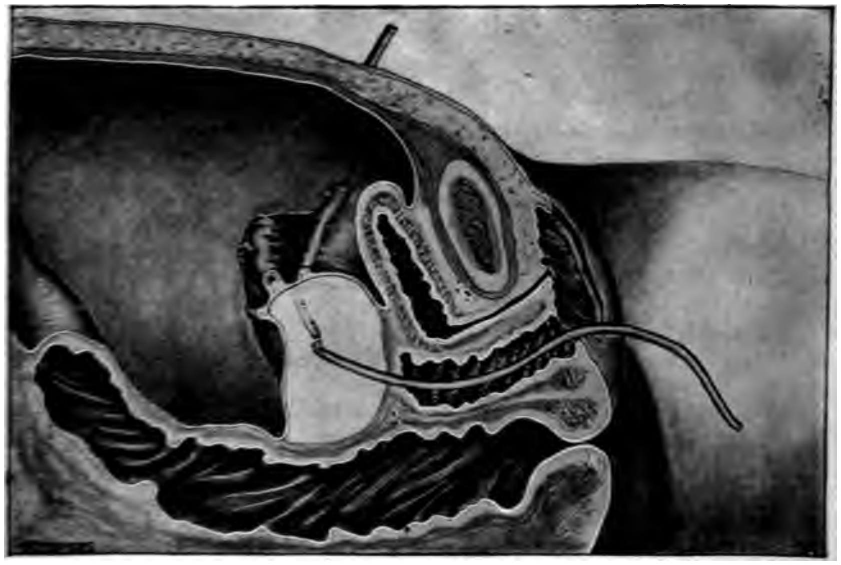


FIG. 259.—(112a) EXTRAPERITONEAL THROUGH-AND-THROUGH DRAINAGE. The tube is carried through the inguinal opening, through the opening in the cul-de-sac, and out through the vagina. (The uterus is cut away in the drawing, the left tube being shown.)

(5) The cavity should be freely swabbed out with 98 per cent. carbolic acid, and then with alcohol.

(6) Two T tubes, one above and the other below, can be introduced, or a through-and-through tube can be utilized (Fig. 259).

(7) The wound should be irrigated through-and-through at first three times, then twice, and finally once daily until all discharge ceases.

A modification of the method of inguinal or inguinovaginal incision and drainage is practiced in certain cases where the pus has accumulated in the retroperitoneal structures and has lifted up and practically obliterated the folds of the broad ligament. Such accumulations occasionally occur in positions so remote from the vagina, and so distinctly above or surrounding the important blood vessels to the side of the uterus, that it is necessary to avoid the vaginal avenue of approach. It sometimes happens that a diagnosis of the exact condition and location of this accumulation can not be made until after the peritoneal cavity has been opened. The median incision, therefore, merely subserves an exploratory purpose. With the finger on the inside of the peritoneal cavity, and acting as a guide, an incision is made along the line of Poupart's ligament, just above its upper border, 3 to 5 cm. in length. This incision is carried down through the fascia below the peritoneal duplication, which is lifted by either the finger or a blunt dissector or the handle of a bistoury, the instrument thus employed being pushed forward until the pus cavity is reached. The operation may stop at this point, the pus cavity being treated by careful irrigation with a saline solution followed by peroxid, and then by 98 per cent. carbolic acid, followed in turn by the alcohol. It should then be packed with gauze or treated with drainage by tube.

Rectal puncture was devised by the elder Byford as a method of election in those cases in which purulent accumulations seemed to press into and point toward the rectum. In certain of these cases a digital exploration of the rectum will indicate a soft fluctuating point. Byford inserted an aspirator needle at this point and drew off the pus, and in certain cases even went to the extent of making a more palpable puncture. It was a convenient point of drainage, and, contrary to what may be imagined, did not result in the formation of a fecal abscess or fistula. When, however, the latter accident did occur, as has happened in a surprisingly limited number of cases, it proved to be so embarrassing as to seriously militate against the expediency of the operation. It is now but rarely adopted.

Aspiration may be considered as a means of evacuating to a certain extent an accumulation of pus rather than as a means of drainage, for the moment the needle is withdrawn the escape of pus is discontinued. It may be used, however, with a degree of safety through any of the avenues of approach at the most presenting point of a pelvic abscess.

112b. PROCEDURE FOR THROUGH-AND-THROUGH DRAINAGE BY THE TRANSPERITONEAL OR THE ABDOMINOVAGINAL ROUTE

(1) A vertical incision is made in the abdominal wall over the presenting part of the fluctuating tumor.

(2) If the tumor proves to be a large accumulation of pus it may be well to siphon it off with a large blunt trocar.

(3) If, upon exploration with the gloved finger, it is found that the pus pocket extends down to the cul-de-sac a counter opening may be made into the vault of the vagina.

(4) The cavity should be thoroughly cleansed with hydrogen dioxid, followed by normal salt solution.

(5) Drainage may then be established and maintained by either one of the following methods:

(a) A Mickulicz gauze drain may be established, as shown in Fig. 260.

(b) One end of a gauze rope may be passed down into the vagina, the cul-de-sac packed with the remainder of the gauze, and the abdominal incision closed (Fig. 260).

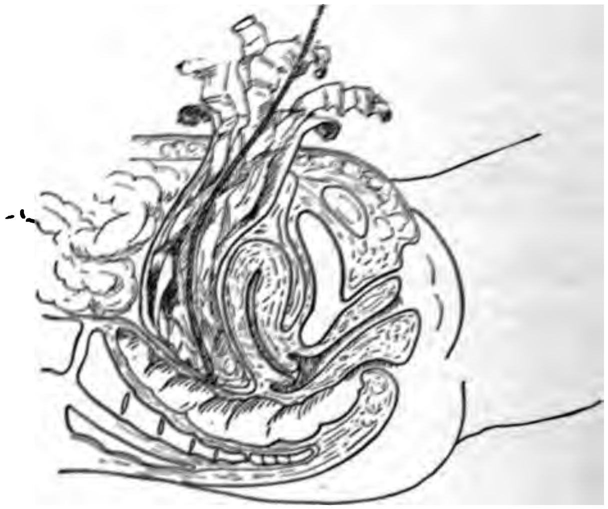


FIG. 260.—(112b) GAUZE DRAINAGE OF THE PELVIS THROUGH ABDOMINAL INCISION. An outer layer of gauze, essentially a sac or envelope, is inserted down to the cul-de-sac; into it are packed the loose strands of gauze, to the inner end of which is attached the silk cord to be used in removing the packing.

(c) One end of the gauze may be carried through from above into the vagina, the middle segment of the gauze packed into the pus cavity, and the other end of the gauze brought out through the abdominal wound (Fig. 261).

(d) Through-and-through drainage may be maintained, either by fixing a T tube in each opening, or by inserting a through-and-through tube.

An efficient through-and-through drainage tube may be readily made from an ordinary piece of soft rubber tubing. Make two openings, one a little above the other (Fig. 262), and each long enough to permit the passage of a tube of similar size through it. The forceps

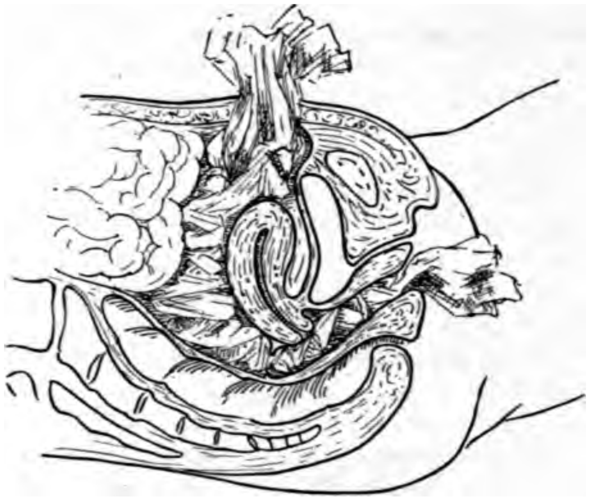


Fig. 261.—A Through-and-through Abdominovaginal Drain of Gauze.

is then passed through each opening (Fig. 263), the end of the tube is folded over and seized, and the tube is drawn through itself (Fig.

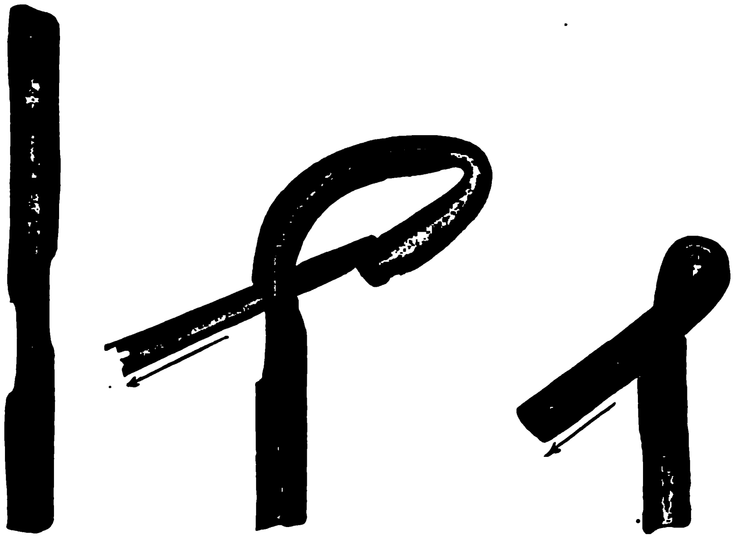


Fig. 262. Fig. 263. Fig. 264.

Figs. 262–264.—Convenient Arrangement of Tube for Through-and-through Abdominovaginal Drainage.

264). The result is that we have practically two tubes, one opening upon one side and the other opening upon the other side of a septum. Thus made, the tube is carried through the inguinal opening, through the opening in the cul-de-sac, and out through the vagina (Fig. 265). The drainage tube should be kept from dropping too far into the wound, and from thus coming out through the vagina, by carefully inserting a safety pin through one side of the tube at a point corresponding to a cutaneous surface. The superficial incision may then be closed, except so much of it as is required for the accommodation of the tube.

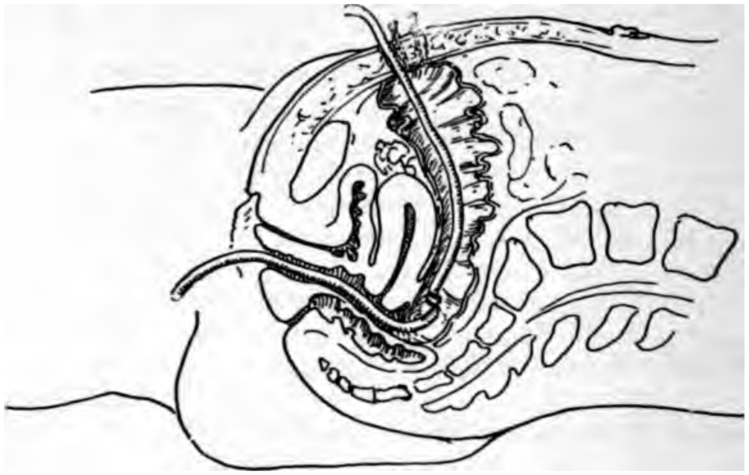


FIG. 265.—THROUGH-AND-THROUGH ABDOMINOVAGINAL DRAIN BY TUBE.

Note on Preliminary Drainage of Pus in Gonococcus Infection of the Fallopian Tubes.—This practice, whichever procedure may be selected, should be adopted only with the understanding that it is a preliminary step. If symptomatic cure should result, as sometimes happens, both patient and surgeon are that much more fortunate. In certain neglected cases it is demanded as an emergency procedure. It ought, however, never to be adopted as an elective measure unless there is an antecedent history of infection, and unless the resulting accumulation of pus is large and clearly demonstrable.

EXTIRPATION OF THE UTERINE APPENDAGES (SALPINGO-OOPHORECTOMY) FOR INFECTIONS

When the Fallopian tubes and the ovaries become the seat of infection, when their structures have become compromised by suppuration, when the acute symptoms are so active and persistent as to become an immediate menace to life, or when there has been a recrudescence of the symptoms following improvement from drainage or other causes, the safety of the patient demands that the diseased organs be removed.

Historical.—An operation that has a life-saving value, such as has been shown by this procedure, deserves a brief review of its history.

While, according to Doleris, salpingitis is not a recently discovered disease, having been described by Spronius and mentioned by Morgagni in his thirty-eighth letter, its surgical treatment has been a matter of but recent development. It is curious to note, however, that, according to Schlesinger, a successful laparosalpingotomy was performed in Russia in 1784. Dr. Seydel was the operator and the patient was a woman aged forty-two, the mother of three children, and had aborted two years previously to the disease which required the operation, viz., a small round and firm tumor observed in the summer of 1783. It was situated on the right side of the abdomen, and in size and consistence bore some resemblance to the uterus in the third month of pregnancy. The tumor grew visibly, especially during the courses, was accompanied by very violent pains, and finally reached the size of the head of a two-year-old child, at the same time becoming evidently softer. Vaginal examination showed that the tumor was connected with the uterus by a round and firm pedicle. In the winter of the same year the catamenia changed in type, while the pains occurred also in the intermenstrual period. The author explained to his patient (a student at his course for midwives) that he believed the right ovary to be diseased, and in his opinion not to be curable without operation. The patient, though informed of the risk of the operation, consented.

The operation was performed on February 21, 1784, in the town of Sarepta, situated in the government of Astrakhan. The patient was prepared with baths, some doses of light laxatives, and Peruvian bark; before the operation she received a small quantity of tincture of opium and saffron, syrup of white poppy, and Hoffmann's drops. After dividing the external abdominal coverings and the muscles in a line drawn from the umbilicus to the right inguinal region across the middle of the tumor, the author severed the peritoneum with a button bistoury, guided by the finger; three arteries were ligated; the protruding intestines were crowded back into the abdomen by means of a napkin soaked in warm milk; the spherical tumor, which was inclosed in a thick firm capsule, and contained a fluctuating fluid, was connected with the uterus by a pedicle, and its upper limit reached the crest of the ilium; on the posterior and lower surface of the tumor the greatly enlarged fimbriæ of the tube were perceptible. The lower and lateral surfaces of the tumor were so closely adherent to the adjoining muscles and organs that it could not be isolated as desired; the author, therefore, concluded to open it. This having been done by a long incision, there exuded a thick, sticky fluid, without odor and of chocolate color, weighing one pound and a half. Careful examination proved beyond doubt that the author had to deal with a tumor of the tube and not of the ovary: "Qua quidem investigatione certo et indubitato cognovi tumoris huius sedem non ovarium fuisse, sed tubam." A decoction of Peruvian bark and a solution of myrrh were then poured into the cavity of the tumor, and a wad of charpie soaked in Balsamum arcæi was placed in the wound of the wall of the tumor. After the intestines had been isolated from the parietal peritoneum by pieces of linen dipped in oil of rose the author bandaged the external abdominal wound with plaster and linen, but subsequently closed it by "suturæ cruentæ."

This operator seems to have been a man of keen surgical intuitions, for nothing else would have prompted him to undertake the operation, while his subsequent conduct of the case made him a prophet of the latter-day canons of surgery. In the first few days after the operation he endeavored to secure free outflow of the fluid which showed a tendency to form in the tumor cavity, to accomplish which he had recourse to tents; these proved inefficient, and he used a silver tube, which likewise proved inefficient, when the zealous surgeon with his mouth to the wound sucked the fetid fluid from the cavity. He repeated this operation four times daily, the patient being directed to lie in the interval with her abdomen turned downward to favor drainage. The fever was thus kept down, the purulent secretion gradually diminished, the odor vanished, the wound contracted, and the patient recovered.

The scientific recognition of these morbid states and their treatment by ablation of the uterine appendages is due, however, to the masterly genius of the late Lawson Tait. In contributing this knowledge to science this great surgeon conferred upon womankind a boon equal to that of ovariotomy itself. This achievement, among the many which stand to his credit, is of itself sufficient to entitle his name to a place upon the scroll of immortality. That the operation has been abused does not militate in the least against its intrinsic worth, or against the fact that it is annually the means of restoring to life and health thousands of women whose untimely death could not otherwise be averted. It was Tait who first insisted that pus in the pelvis was subject to precisely the same laws of surgical treatment as pus in any other accessible portion of the body. This axiom, the acceptance of which was strenuously resisted by many who were manifestly unfamiliar with the technique necessary for carrying it into execution, has, in the years which have elapsed since it was first enunciated, been accepted by the entire medical profession. To-day there are no dissenting voices.

The extirpation of the uterine appendages, however, places the loss of the reproductive function beyond hope of redemption. This is always a matter of serious moment, and is a result to be avoided whenever possible. The beneficent impulses of the medical profession have naturally become active in efforts to avert the extreme destruction induced by a naturally destructive disease. Efforts are, therefore, being made to conserve the organs and to perpetuate their functions. This conservative tendency, however, is not in contravention of the law of Tait, for the elimination of pus and the arrest of infection are just as much aimed at by conservative as by radical measures.

There is a strong probability that the efforts at conservatism have thus far resulted in a larger proportion of failures to arrest the infectious processes than is to be attributed to the radical operation, while the restoration of function, particularly as it relates to conception, while realized in but a small number of cases, must stand as the vindication of efforts to save the tubes or the ovaries in whole or in part. The present tendency and the present necessity, as stated by Coe, are not so much to ascertain the limitations of the radical operation as to determine just when the recognized conservative method should and should not be applied.

It may be taken as a rule to which there are but few exceptions that a tube that is the seat of infection resulting in purulent accumulation, associated with occlusion of both the uterine and distal orifices, is not amenable to any other treatment than that of extirpation. The exceptions to this rule, if there are any, can not be determined before operation. It has not yet been demonstrated that fimbriæ that have been curled inward and sealed by plastic exudation have ever afterward become spontaneously disentangled, with the restitution of the tubal orifice; nor has it ever been demonstrated that a Fallopian tube thus sealed can, without surgical intervention, again subserve the purposes of an oviduct. Conservative measures, such as drainage, may conserve the structural integrity of the tube, but they can not be expected either to restore or to perpetuate its functions. The conservatism thus practiced must, therefore, have its distinct limitations. The expediency of conserving a functionally useless structure, which thereafter can be potent only for mischief, is open to serious question. The restoration of tubes which have been the seat of former infection may be undertaken as an operation of election in cases of sterility, in which the reëstablishment of the reproductive function is a matter of extreme necessity.

Indications for Extirpation of the Uterine Appendages for Gonococcus Infection.—Acute infection of the uterine appendages, with symptoms that rapidly increase in severity in spite of rest and cold applications over the pelvis, calls for surgical intervention. If the acute symptoms—high but irregular temperature with vacillating pulse rate and general indications of acute but receding sepsis—have declined, leaving sufficient of pathologic changes in the pelvis to interfere with the health and efficiency of the patient, an exploratory operation should be done with reference to the ablation of the appendages if found justifiable. If a preliminary drainage operation has been done, followed later by either persistence or recrudescence of the original symptoms, an operation should be done without delay. If these indications for operation are ignored, all other things being equal, the medical attendant places his patient in more jeopardy than by advising operation.

113. TAIT PROCEDURE FOR THE EXTIRPATION OF THE UTERINE APPENDAGES WHEN THEY ARE THE SEAT OF GONOCOCCUS INFECTION

(*Salpingo-oöphorectomy*)

(1) The patient should be placed in the recumbent or in the Trendelenburg position.

(2) A vertical incision from 8 to 10 cm. long is made in the median line of the abdomen, from low down above the pubes toward the umbilicus.

(3) The omentum and intestines, if free, are carefully drawn up out of the pelvis; if they are adherent the omental adhesions may be forcibly broken up and the torn ends controlled by hemostatic forceps.

(4) Two fingers in the abdomen should be carried directly to the fundus of the uterus, from which landmark the Fallopian tubes should, if possible, be traced out to either side. They will generally be found to occupy a position back of the broad ligaments and well down into the cul-de-sac.

(5) If they are free they may be dealt with as hereafter indicated; if adherent, care should be taken to find the line of cleavage between the appendages and the posterior pelvic wall. This line of cleavage once found, it should be followed gently but firmly by the fingers until the adherent tube and ovary are shelled out of their nest. Care should be taken to get them out, if possible, without rupturing the tube and spilling its contents in the field of operation.

(6) The other side should be similarly treated, if necessary.

(7) At this stage or earlier, if possible, the intestines, as soon as liberated, should be assisted to gravitate into the abdominal cavity and be walled off by gauze roll (Figs. 266, 267).

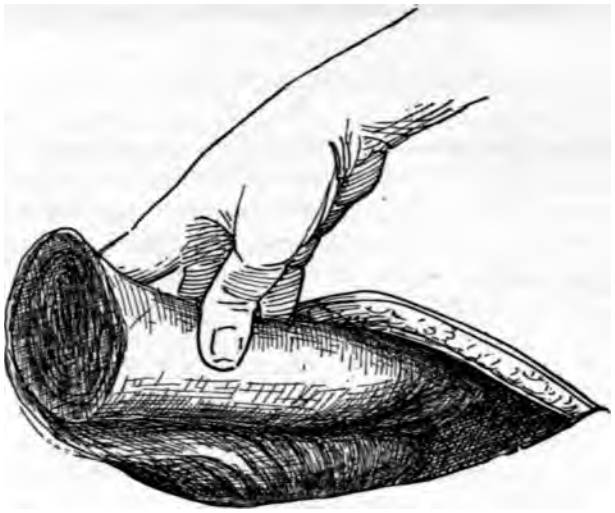


FIG. 266.—(113) PROCEDURE FOR SALPINGO-OÖPHORECTOMY. (a) Introduction of the gauze roll to wall off the intestines.

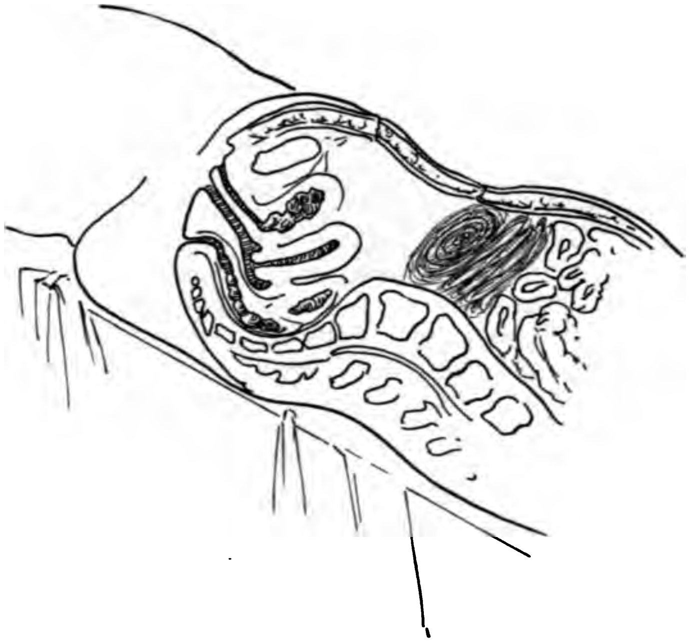


FIG. 267.—(113) PROCEDURE FOR SALPINGO-OÖPHORECTOMY. (b) Operation of the gauze roll to wall off the intestines.

(8) The appendages on one side should then be drawn up; and (a) the ovarian artery ligated under the tube near the uterus; (b) the tube is then seized by a hemostatic forceps near the uterus and (c) excised from the uterus by a notched incision, made with scissors, extending above 4 mm. into the uterine tissue; (d) the tube is then cut away with scissors along the margin of the broad ligament to and including the ovarian ligament, by which the ovary is excised in one piece with the tube. (e) The margin of the broad ligament is then stitched with a continuous suture (Fig. 268).

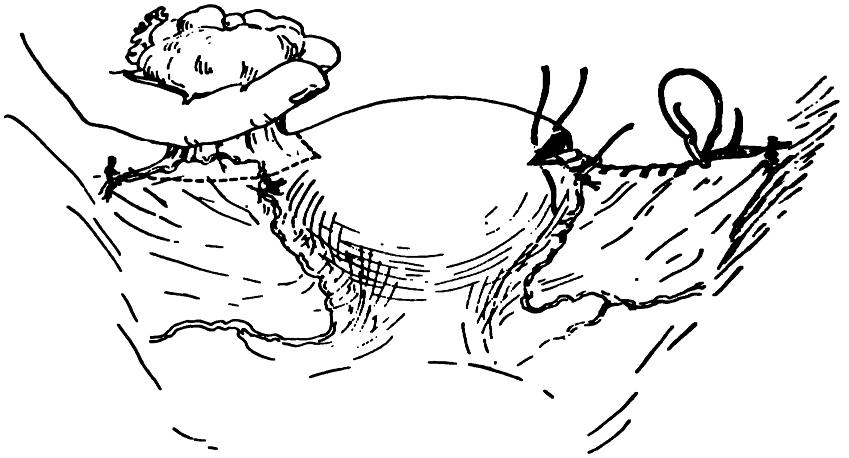


Fig. 268.—(113) Procedure for Salpingo-oöphorectomy. (c) The infected tube and ovary have been removed and the broad ligament sutured on one side; the initial steps of the procedure are indicated on the other side.

(9) The other side is treated in the same way.

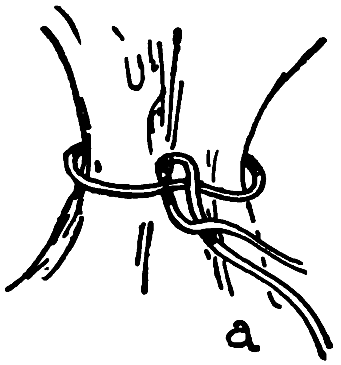


Fig. 269.—(113) Procedure for Salpingo-oöphorectomy. (d) Staffordshire knot.

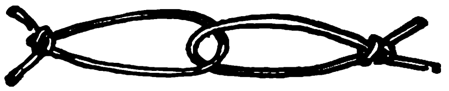


Fig. 270.—(113) Procedure for Salpingo-oöphorectomy. (e) Double locked ligature.

(10) After toilet of the peritoneum the establishment of drainage, if required, and removal of the gauze roll, the abdomen is closed.

The preceding description applies to the usual procedure of election. There are, of course, many variations in the details. Some operators use the *en masse* suture, which transfixes the broad ligament and is then made to embrace the ovarian ligament, a loop of the broad ligament, the ovarian artery, and the leaflets of the broad ligament. Lawson Tait, who devised the operation, controlled the condition with the Staffordshire or binder's stitch (Fig. 269). He employed a heavy cabled silk which, when firmly tied by him, was a very reliable suture against hemostasis. It, however, frequently became infected and gave rise to sinuses, which prompted operators very generally to abandon it. The lock stitch (Fig. 270), also an *en masse* ligature embracing the same structures as the preceding, is frequently employed by operators.

The ovaries ought clearly to be removed if they are seriously diseased; if not, however, they ought to be left, as their internal secretion plays an important part in maintaining the normal equilibrium of the patient. The question of drainage is to be determined by the conditions at the conclusion of the operation. If hemostasis is complete, and if the field has not become contaminated in the course of operation, the abdomen may be closed without hemorrhage. If, however, there is much oozing of blood, or if the field has been bathed in pus, drainage by some of the methods already described should be established.

TREATMENT OF GONOCOCCUS INFECTION OF THE URETHRA AND BLADDER

Treatment of gonorrheal cystitis is (a) medical and (b) surgical.

Medical Treatment.—Medical treatment must take into consideration the various causative or contributory factors, and, as far as possible, eliminate them from the case. As the bladder possesses considerable reparative power, each case of cystitis should be diligently studied in order to discover and abate, if possible, all such factors as favor infection or diminish the resisting power of the bladder. Attention should thus be directed to infections about the vagina, vulva, and urethra; to strictures of the urethra, or other causes of obstruction to the free escape of urine; to intrapelvic infections of tumors that press upon or distort the bladder; to intestinal diseases that may permit direct or indirect infection of the bladder; to septic foci in the kidneys producing descending infection; to abnormal, irritating conditions of the urine, and to foreign bodies or tumors in the bladder, etc.

Having relieved these conditions so far as possible, attention may be directed to the bladder itself. In acute cases the patient should be confined to bed. An abundance of water should be given to dilute such as potassium acetate, some of the salts of lithia, or sodium benzoate.

Local Treatment.—Local treatment should consist of lavage of the kidney, practiced by ureteral catheterization. A solution of argyrol (25 to 50 per cent.) or protargol (1 to 2 per cent.) in water should be thrown directly into the pelvis of the kidney. From 25 to 100 c. c. can usually be injected before the patient complains of the pain of distention, when, of course, the injection should be discontinued. The fluid or most of it should be left in the kidney and permitted to come away through the ureter. The treatment should be repeated daily until the urine is clear, and a few times at longer intervals thereafter. Hagner uses a solution of silver nitrate (1 per cent.) for later injections.

Surgical Treatment.—The destruction of kidney tissue may be so extensive that the conservative treatment just outlined may not meet the indications of the case. Under such circumstances either incision and drainage of the kidney (nephrotomy) or its complete removal (nephrectomy) are to be taken under advisement (see Nephrotomy and Nephrectomy under Bacillus Tuberculosis Infection).

CHAPTER III

SPIROCHÆTA PALLIDA INFECTION (SYPHILIS)

The Vulva.—Chancre of the vulva, vagina, or nipple is the form in which syphilis most frequently invades women. True chancre of the rectum is uncommon. Of these locations those at the vulva and introitus vaginæ are the more frequent. The fact that the lesion is often comparatively painless, and that the parts are difficult of inspection by the patient herself, explains why the condition often escapes observation, its existence being determined later by the cicatricial footprint of the ulcer. The characteristic induration of chancre seems to be less pronounced in women than in men.

Chancres are generally single, but they may be double or multiple.

VARIETIES.—For clinical purposes Ravogli has divided vulval chancres into (1) superficial or chancrous erosions; (2) scaling papule; (3) elevated papule or ulcus elevatum; (4) incrusted chancre; (5) indurated nodules; (6) diffused exulcerated chancre. In addition to these there exist ulcers of the vulva that occur late in the history of syphilis, but in which the spirochete can be demonstrated.

Superficial or *chancrous erosion* is the form most frequently met with in women. It is difficult to recognize in its earliest stages; it is always found on the surface of the mucous membrane, beginning as a red spot, somewhat deeper in color than the mucous membrane itself. It is liable to pass without notice, so that when first seen by the physician it is already deprived of its epithelium and manifests incipient ulceration. When it is seated on smooth surfaces, like that of the labia, it is easily recognized, but when it is on the fourchette or within the ostium vaginæ it is not easily discovered. The chancre is of red color, round, with a smooth surface, from which there oozes a thin secretion that assumes the appearance of true pus only in the presence of active inflammation. In these chancres the induration is only superficial, of that kind which Fornia called *chancre parchemine.* The diagnosis of this form of chancre is made from the foregoing appearances. Its course is rather short; it undergoes speedy evolution, which accounts for the fact that constitutional symptoms of syphilis are manifested in some women in whom we are not able to find the initial sore. In many cases, however, after the disappearance of the chancre there remains on the area that it occupied a kind of red spot, very persistent, and lasting at times for months. This chancrous erosion, especially when located on the vulvar lips, produces a kind of chronic edema of the underlying tissues, and sometimes of all the pudendal structures; it lasts frequently after the chancre has completely healed. When the primary ulcer is seated on the fourchette it assumes the typical induration of a hard chancre, presenting a raw-beef appearance characteristic of the initial syphilitic lesion.

The *scaling papule* may appear on the skin of the labia majora and of the labia minora as the initial syphilitic lesion. It is a small, dull-reddish papule, slightly elevated. It develops into an elevation of the skin, has a purplish brown color, sharply defined edges, and in size varies from that of a split pea to that of a quarter of a dollar. It is round or oval, according to the shape of the parts where it is located, and is firm, hard, and resistant to touch. It is usually single, sometimes double, and gradually loses its epithelium, becoming ulcerated and incrusted, when it is called an ecthyomatous chancre.

The *elevated papule,* or *ulcus elevatum,* begins as a chancrous erosion with hyperplastic infiltration, and grows to a considerable size. It is round or oval, deep red in color, and has a smooth, velvety surface, flat or concave, with distinctly elevated edges, and discharges a thin, serous fluid. Irritation from walking or from uncleanliness may provoke inflammation, causing a pronounced edema of the labium on which it is seated. Careful palpation will reveal a slight induration, parchment-like in character. This condition is essentially chronic, lasting many weeks, resolving slowly, leaving a deep red spot which is replaced by a scar.

Incrusted chancre affects the cutaneous surface of the pudendum, beginning as a chancrous erosion or as an indurated nodule, and speedily developing a kind of film of a light, greenish, creamy tint, or, at other times, of a brownish-red necrotic character.

The *indurated nodule* is rather rare in women and is found where the skin and mucous membrane join each other. It manifests itself as a sharply circumscribed mass of indurated tissue with a narrow base and sloping edges.

The *diffused exulcerated chancre* is found in women of the lower class; it begins as a chancrous erosion, grows to an ulcus elevatum, and then spreads over an extensive area. It has an ulcerated and uneven surface, deep red in color, but only slightly painful, although frequently associated with edema of the part on which it is developed.

Late ulcers of the vulva, that is to say, ulcers appearing long after subsidence of the initial lesion, have been described by Hugnier and

Duncan and have been frequently observed by Ravogli in the venereal service of the Cincinnati Hospital. The last-named authority supports the opinion of Hyde in denying that those ulcers of the vulva have anything to do with lupus vulgaris. He admits that the extreme destruction of the external genitals of women which is occasionally observed may be due not to syphilis alone, but probably to syphilis in connection with tuberculosis, and records one case in his service in which a large and deep ulcer had destroyed part of the labia minora and part of the entrance of the vagina. The woman died, and at the post mortem the perineum was found to be studded with tubercles. Usually these ulcers are found in weak patients, with a system run down from misery and debauchery.

The ulcers are always seated on a strong and thick induration which is confined to one or both labia. This infiltration sometimes extends to the mons veneris, and may also spread downward to the perineal tissues. It is accompanied by a kind of hypertrophy which is felt deeply situated in all the tissues. On these indurated places ulcers are found which are deep and destructive. One or both labia may be destroyed. Sometimes, when the ulceration affects the perineum, the destruction may extend to the anus, producing alteration of its function.

The edges of these ulcers slope to the bottom, which is red or grayish from necrotic detritus, without a tendency to the formation of healthy granulations. The destruction once begun goes on very rapidly, and it is difficult to stop its ravages. Says Ravogli: "In my experience I have found this form of vulvar syphilitic ulcers more frequent in the negro race than in the white race. The date of infection from syphilis was from six to twelve years. No enlarged glands could be found in the groins or in the cervical region, yet in many of these women deep scars could be found on the legs, witnesses of progressed gummata, and roughness of the tibia could be found, showing progressive specific periostitis. These ulcers are the result of late syphilis. They are the result of gummatous infiltration, but there is no doubt that the virulence of the syphilis has much to do with the general condition of these patients."

The Vagina.—Syphilitic infection of the vagina manifests itself by chancres which in the lower part of the canal manifest many of the characteristics of those [illegible] the vulva. Gummata of the external organs, extending to the vagina, [illegible]

The Uterus.—The [illegible], according to Virchow, may be the seat of [illegible] "Papular swellings" or [illegible] in connection with other syphilitic manifestations in the same subject. Gummata of the cervix are not rare. There are no authenticated records of gummata involving the body of the uterus.

The Fallopian Tubes.—The Fallopian tubes may be the seat of gummata, Bouchard and Lepine having observed them in cases with gummata in the liver, spleen, and elsewhere.

The Ovaries.—The ovaries have been said to be the seat of tertiary manifestations. Certain syphilographers speak of "gummatous oöphoritis," and then proceed to describe cirrhotic conditions that gynecologists observe daily in non-syphilitic cases.

The Pelvic Lymphatics.—The pelvic lymphatics, both in the groins and the broad ligament, may become the seat of acute infection, resulting in abscess (bubo) or, in later stages, they may become the seat of gummata. I have removed a gummatous tumor from the broad ligament as large as a man's fist.

The Nipples.—The nipples may be the seat of both chancres and mucous patches. Interstitial syphilitic mastitis is but rarely observed, although gummata of the mammary glands are more frequent. Both primary and later manifestations have been observed in the *rectum* and *anus*. In one case under my observation a large rectal gumma broke down and formed a fistula between the rectum and vagina.

The Bladder.—The bladder is often found to be the seat of mucous patches, and, in certain instances, of condylomata obviously of syphilitic origin.

Pathology.—The changes occurring in indurated chancre are of an inflammatory character, and are accompanied in any stage of syphilis with a persistent involvement of the blood vessels; and infiltration of small round cells associated with those of larger size, and polyhedral in form, occurs in the meshes of the connective tissue, especially in the initial chancre, and again in the later tertiary stage, as manifested in the nervous system. The perivascular changes and the infiltration of the tissues beyond the chancre are the most important features of the initial sore. The lymph spaces are readily affected with the peculiar infiltration, the virus speedily traveling through this channel to the inguinal glands. The peripheral, perivascular lymph spaces are infected by the time the chancre makes its appearance; and the first halt in the march of the virus is shown by the swelling and induration of the inguinal glands. Microscopically a well-developed chancre reveals a seminecrotic mass of small spheroidal cells which constitute the bulk of the ulcer, circumvallated by a zone of edema and a cellular infiltration of the papillary layer of the derma. This edema acts as a wall to protect the surrounding healthy tissues from invasion. The virus, having entered the lymphatics, passes from one gland to another until it reaches the general circulation. This occurrence marks the transition from the secondary, or incubation, period, and the disease breaks out in the ordinary form of roseola, with all the accompanying symptoms of chlorosis, neuralgia, syphilitic fever, and other manifestations of tertiary symptoms.

Mucous patches are sometimes the most stubborn manifestations of syphilis, as they show a tendency to frequent recurrence. When not properly treated they may become hypertrophic, forming papillomatous masses which may persist for a long time. They usually disappear by a process of superficial ulceration and without leaving a scar. The anatomopathologic lesions of mucous patches consist in hypertrophy of the papillæ and in abundant infiltration of cells throughout the papillary layer and the corium. The mucous layer of the epidermis is also affected, showing a proliferation of the cells and a granular change of their protoplasm that gives to the cells a peculiar appearance. In the ulcerated patches this becomes obscure. On account of the dusky appearance of the infiltrated papillæ, the mucous layer in many points being absent, and the tips of the papillæ mutilated by ulcerative process, mucous patches, when once seen and identified, will always be recognized. There can be no doubt that they are an exclusive form of constitutional syphilis.

As a result of persistent irritation the patches may become uneven with a verrucous aspect, caused by hypertrophy of the papillæ of the derma, a hypertrophy which sometimes assumes a vegetating character (condylomata lata). These different appearances of mucous patches have caused authors to classify them as diphtheroid, ulcerative, vegetative, or hypertrophic. They are round or oval in shape, according to the part upon which they are located; sometimes they appear like ulcerated rhagades around the ostium vaginæ or between the anal folds. On the mucous membranes mucous patches have a kind of grayish appearance with marked edges slightly excoriated in the center. The chronological period of mucous patches is the secondary stage from its beginning to its end. It is not rare to see patches on the tongue and in the mouth of syphilitic patients after four or five years following the primary infection, and mucous patches are disposed to form at the anal margin during the second stage of syphilis. They are moist, slightly elevated, and give off a foul odor, are grayish in color, and are found more frequently in this locality than perhaps any other manifestation of this disease. When the parts are not kept clean they multiply swiftly and coalesce, forming thick warty masses, called condylomata, and are covered with an offensive discharge that soon inoculates the neighboring skin and membrane; in fact, if allowed to run an uninterrupted course, they may attain enormous proportions.

Symptoms and Diagnosis.—The *presumptive diagnosis* of spirochete infection, whether primary, secondary, or even later in the chronologic order of manifestation, is to be made by a careful consideration of the preceding clinical characteristics. The positive diagnosis in local manifestations is made by demonstrating the presence of *Spirochæta pallida* in secretions or scrapings from the suspected chancre, or from mucous patches. This can be done in every case that has not been cauterized down to the non-infected tissues, or that is not practically healed, or that is not the seat of mixed infection. In cases in which reliance is had exclusively upon clinical characteristics to the exclusion of microscopic findings the chief source of confusion is to be found in herpes and furunculosis. Herpetic eruption on the vulva, as elsewhere, is characterized by multiple small but definitely grouped vesicles with soft base and tending to spontaneous disappearance. The groups themselves may be multiple. In chancre the manifestation is rarely vesicular, is single, with indurated base, and tendency to chronicity. Furuncles, or boils, may be single, but are more generally multiple, are painful, run a short and very acute course, and terminate by distinctively circumscribed suppuration, the relief of which is followed by rapid and spontaneous cure. Gumma of the vulva may be mistaken for a cystic vulvovaginal gland or for a non-specific neoplasm. It is known by the previous syphilitic history of the patient, by its tendency to develop chiefly in the labium major, by its chronicity, and by the fact that it usually terminates spontaneously by fatty degeneration rather than suppuration. The occurrence of such a lump should be accepted as presumptive of an internal manifestation of syphilis. Gummata of the pelvis may be mistaken for enlarged ovaries, ovarian cysts, distended Fallopian tubes, myomata developing from the side of the uterus, or even lateroversion of the uterus itself. Laden intestines in enteroptosis may also be a source of confusion. As a rule, gummata in this location are not diagnosed until after operation. The *positive diagnosis of internal manifestations of syphilis,* in which there is no superficial lesion from which the *Spirochæta pallida* may be demonstrated, is to be made by the Wassermann-Noguchi reactions.

Chancre of the nipple, like chancre elsewhere, appears after about 25 days following exposure to the infection, which, to be effective, must occur at the site of some abrasion of the epithelium. It manifests itself by a small painless lump or nodule, hard and red, which speedily ulcerates. The ulcer thus formed is of the indolent variety, with smooth edges, a smooth, non-granular bottom, and with an indurated base which feels much as if a disc of parchment were imbedded in the cellular tissue. The ulcer from the start secretes a scanty serous fluid. In from six to twelve days painless induration of individual lymphatics appears, especially in the axilla. Demonstration of the *Spirochæta* *pallida* in the secretion of a chancre establishes the diagnosis, which may otherwise be a matter of some difficulty. This demonstration can be made in approximately all cases of chancre that have not been treated by escharotics or active germicidal applications, or that are not practically healed at the time of examination. A suspicious sore of the nipple ought, therefore, to be carefully examined for spirochetes and its true character be thus determined before beginning active treatment. Mucous patches are manifestations of secondary syphilis that have been observed in the nipple and on proximate cutaneous surfaces in cases of pendulous breasts. They are moist, papular syphilids and erosions and their secretion is scant but offensive. This secretion abounds in spirochetes, which serve to establish the diagnosis. *Gumma* of the breast may be mistaken for a non-specific neoplasm. The condition is very rare, and its identity is to be established by the history of the case, by the Wassermann and Noguchi tests, and by diagnostic therapy. *Diffuse syphilitic mastitis* may occur from the extension of the infection, pure or mixed, from a primary lesion of the nipple, or it may occur from a gumma, which may act as a nidus of infection. Here, too, especially in late cases, the Wassermann and Noguchi tests may be essential to accurate diagnosis.

Gummata of the rectum are not seen especially frequently, even by those physicians who do a large practice in rectal surgery; at the same time they are to be found in the rectum more often than is generally believed by the profession, and with greater frequency in this locality than elsewhere in the intestine. When detected early in their formation they give to the finger a sensation similar to that of an abscess before fluctuation is present; in other words, they feel like thick, flat, indurated masses in the rectal wall. After they break down the rectum feels ragged to the touch because of the nodules and intervening ulceration. As a rule, healing occurs as the mass gives way, and the ulceration extends until sufficient contractile tissue is formed to make a tight stricture. Gummata are rarely numerous and large enough to obstruct the caliber of the bowel to any serious extent. Neither do they cause a great deal of pain by pressure upon the nerves. On the other hand, when a stricture has followed their breaking down the suffering of such patients is pitiable to behold; they spend most of their time in the closet without relief, have local and reflected pains, itching about the anus, pass large quantities of pus, blood, and mucus, and frequently suffer from abscess, fistula, and occasionally incontinence.

Treatment.—The treatment of suspected spirochetic (syphilitic) infection should not be inaugurated until all resources for positive diagnosis have been exhausted. In other words, efforts should be made (a) to demonstrate the spirochete in every suspected local lesion, and (b) to determine by the Wassermann-Noguchi tests whether or not, in these cases or in those of longer standing, constitutional contamination has occurred.

(a) If by these positive means it shall be determined that the *Spirochæta pallida* is present in a primary sore, but that constitutional contamination has not occurred, the ulcer should be freely excised down to the normal tissue. The area thus exposed should be treated as an open sore, with pure salvarsan, or with protargol, or even with the mercuric bichlorid in strong solution.

(b) If by the positive means enumerated it shall be determined that the *Spirochæta pallida* is present and that constitutional invasion has already occurred, the local lesion should be repeatedly cauterized by the pure silver nitrate, while the patient should immediately receive a full intravenous dose of salvarsan. The chancre thus cauterized should be repeatedly cleansed and dressed with a two per cent. solution of protargol. The best treatment, in Ravogli's opinion, for mucous patches is to wash the surface well with an antisyphilitic solution of mercuric bichlorid, 1 to 2,000, and after a while to dry and powder them with calomel. In some cases the mucous patches are extremely stubborn, with a tendency to ulceration and hypertrophy, and in these cases it is necessary to use caustics. The application of a 4 per cent. solution of acid nitrate of mercury produces a superficial cauterization, and we may be sure that, after touching the mucous patches two or three times with this solution, they will readily heal. Sometimes the mucous patches resist the application of the solution of acid nitrate of mercury, and in these cases it is necessary to resort to stronger caustics; then nitric acid in full strength is useful for the destruction of these patches. The application of salves or plasters to mucous patches is not to be recommended, because they are found where the skin forms folds and is macerated by the perspiration; it is better, therefore, to use antiseptic bathing and the application of dry powder, which will prevent the accumulation of the perspiration. One part of powdered acetanilid to three parts of powdered talcum makes a very desirable application.

(c) If by the means of positive diagnostic methods enumerated the *Spirochæta pallida* cannot be demonstrated in a vulval sore, but constitutional contamination can be demonstrated, the patient should be given the intravenous treatment by salvarsan, and the vulvar sore should be kept clean and treated with antiseptics frequently applied.

(d) If the case is one of late ulcer of the vulva, confirmed by positive methods of diagnosis, the patient should be given the intravenous treatment by salvarsan as an initial step. This should be followed by antisyphilitic treatment, consisting mostly in the administration of potassium or sodium iodid. Mercurials can scarcely be recommended on account of the weak and poor condition of the patients. Beneficial results follow applications of a solution of mercuric bichlorid, 1 to 2,000, and then covering the ulcerated and infiltrated surface with the emplastrum hydrargyri, which, producing an abundant suppuration, in a short time causes a sloughing out of all the detritus from the bottom of the ulcers. In the same way the application of the emplastrum hydrargyri helps a great deal toward the absorption of the infiltration and edema which form the base of these vulvar syphilitic ulcers. The washing with peroxid of hydrogen and the application of powdered iodoform have also given very good results, but only in later stages, when the emplastrum hydrargyri had already diminished the infiltration. The curette has been used in cases where the surface has been covered with abundant ill-natured granulations. But with this exception there is but little need for curetting such ulcers. The application of strong caustics, such as nitric acid and the actual cautery, has been tried only in those cases in which the destructive process had taken wide proportions. It is seldom necessary to resort to these means, particularly when good results are realized by the emplastrum hydrargyri.

SPIROCHÆTA PALLIDA INFECTION OF THE BREAST

Treatment.—In all cases nursing should be vigorously interdicted. As soon as a sore on the nipple is demonstrated by the presence of spirochetes to be syphilitic it should be cauterized by the silver nitrate, pure, and then dressed with moist bichlorid gauze. This cauterization should be repeated every two or three days, until the character of the ulcer is changed and normal tissue can be seen at its base and margins. It will then heal with rapidity under continued moist antiseptic dressings.

In all cases in which the breasts show mucous patches, a gumma, or diffuse syphilitic mastitis, or other secondary manifestations, the patient should be given the intravenous injection, or injections of salvarsan, followed in all instances by more or less prolonged antisyphilitic treatment, consisting of the iodids, alternating with mercury. The medical treatment, even in the presence of apparent cure, should be continued for at least six months.

CHAPTER IV

BACILLUS DUCREY INFECTION (CHANCROID) OF THE GENITO-URINARY TRACT IN WOMEN

This infection occurs primarily as a soft sore of the external genitalia, its further manifestations being limited to the inguinal and pelvic lymphatics with incidental toxemia. Occasionally these sores occur at the margin of the anus. They cause more suffering in this location than when located on the penis or vulva, which fact is attributable to the irritation caused by the feces passing over them. They are usually multiple, superficial, and have sharply defined edges, are sensitive to the touch, and give off a discharge which irritates the skin, causing a pruritus that is difficult to relieve. Now and then they extend up the rectum, and, when healed, a sufficient amount of contraction follows to produce a stricture. They are occasionally seen to become phagedenic and rapidly eat their way into adjoining structures, entirely destroying the external sphincter in less than a week's time.

Ducrey discovered the constant bacterial element in chancroidal pus. He found in a series of inoculations of chancroid in man that many microbes originally in the pus disappeared from it, but that a peculiar microbe remained constant and abundant so long as the pus retained its virulence. His observations were supported by those of Unna and others, all agreeing on the identity of this microorganism. Ducrey found it in chancroidal pus, and Unna detected it in the infected tissues. It is a rod-like bacillus, from 1.5 μ to 2 μ in length, and from 0.3 μ to 1 μ in breadth, with rounded ends. It has a tendency to form chains (streptobacillus) and to become agglomerated in masses. In the pus it occurs singly, but in the tissues it is always in chain form. It has been found almost constantly in chancroid; it is stained by carbolic-fuchsin and by gentian violet, and is decolorized by Gram's method. Although it is a pus bacillus it is characteristic of soft chancre, because it has not been found under other conditions.

Clinically considered, chancroid is a local, contagious ulcer, which is the result of inoculation from another chancroid and is inflammatory in character, with destructive characteristics which never produce syphilitic or other systemic infection. It sometimes, however, causes inflammation of neighboring lymphatic glands resulting in their suppuration—a condition called *chancroidal bubo*. It sometimes becomes serpiginous, spreading from its original place to the different parts of the pudendum, or even to the abdominal walls; or it may become very destructive, a condition designated *phagedenic chancroid*. Chancroid is usually met with in the lowest class of society, where ignorance and filth are found together. It is essentially a venereal disease, as it is transmitted chiefly, if not exclusively, by the act of sexual intercourse. The secretion of the chancroid or the pus of the chancroidal bubo, is the carrier of the contagion. It has been demonstrated that the contagious germs of a soft chancre are contained in the lymphoid bodies or in the pus cells, inasmuch as the inoculation by filtered serum derived from these sources produces only negative results.

One of the characteristics of chancroid is its self-inoculability, by which is meant that the surface primarily inoculated will in turn inoculate another surface with which it lies in contact. Immunity from self-inoculation is never acquired. The communication of the infection from one surface to another requires the preexistence of an abrasion, excoriation, or small fissure, through which the virus finds its entrance into the derma. In some cases the infectious element finds its way into the ducts of the excretory glands or into the hair follicles, producing round ulcers called follicular ulcers, which indicate the channels through which the virus entered. Mediate contagion is more rare in chancroid than in syphilis. Any article, such as clothing or the seat of a water-closet, soiled with purulent secretions from chancroids, it is said, may communicate the contagion, but Ravogli has never met a case in which he could verify this theory.

Soft chancres may be found in women primarily at the ostium vaginæ, on the fourchette, the vestibule, the clitoris, the labia majora, the labia minora, the perineum, the inner surface of the thighs, the two lower quadrants of the abdomen, and around and within the margins of the anus; and they appear, secondarily, by self-infection, upon proximal surfaces, and wherever the infection may be carried to a break in the protecting epithelium. On the labia they are generally associated with follicular abscesses, edema, and frequently with extensive destruction of tissue. Purulent secretion drying upon the surface occasions an eczematous appearance. The terms exulcerous, follicular, acneform, eczematous, erythematous, serpiginous, and phagedenic have been applied to chancroids to distinguish obvious physical or clinical characteristics.

Diagnosis. Chancroid virus, unlike the *Spirochæta pallida* of syphilis, begins its activity as soon as it finds an infection atrium, through which it gains access into the subepithelial layer; the ulceration of the surface of the skin appears later, but is more rapid in development on the vaginal mucosa. As a rule, the virus manifests its activity by developing within from twenty-four to forty-eight hours a small pustule, surrounded by an intensely red, inflammatory halo. This stage, especially in the mucous membrane, is soon replaced by the characteristic ulceration, round or oval in shape, according to the conformation of the parts; thus, when developed within a fold, it may take on a linear appearance, while on the inner aspects of the labia majora the ulcers may coalesce and become irregular. But, wherever the chancroid occurs, or whatever its shape, the edges are sharply cut as if the disk could be readily punched out. The bottom of a chancroid is uneven, and in the beginning is covered with a kind of diphtheroid membrane consisting of necrotic tissue. The ulcer exudes abundant thin, purulent secretion, sometimes of a rusty color; the underlying cellular tissue is sometimes edematous, particularly when the inflammation is intense, in which case the soft chancre manifests firmer consistence when taken between the fingers, which fact must not mislead the practitioner into mistaking the case for one of syphilis.

Chancroids in the earlier stages may be mistaken for herpes, but the difference will be detectable by a careful examination of the lesions. Vesicles, a non-ulcerated surface even when broken, smooth edges, and the coalescence of vesicles are features of herpes. Sometimes chancroids are mistaken for syphilitic mucous patches; the development, size, induration, peculiar color, elevation of the edges, and symptoms of syphilis will, however, enable physicians to distinguish between the two conditions. If doubt still remains recourse may be had to the crucial test of self-inoculation.

Prognosis.—The prognosis of chancroids is less favorable in women than in men. The conformation of the parts, the difficulty of cleansing them and of retaining dressings, the presence of urine and of the menstrual fluid are all barriers to a speedy cure. Suppurative adenitis, or buboes, prolong the treatment. Phagedena, fortunately rare, is generally promptly overcome. In cases occurring in drunkards of lowered vitality a guarded prognosis should be given.

Treatment.—This, to be effective, must be based upon the principle of cleanliness. Ravogli secures this in his hospital service by having the parts washed three times a day with hydrogen peroxid, dusted with iodoform powder, and covered with iodoform gauze. Cure is generally very prompt and free from complications, no buboes having developed in his wards. In rapidly progressive chancroids cauterization by carbolic acid or nitric acid should be practiced. The surface should be first rendered insensitive with a 5 per cent. solution of cocain hydrochlorid. Care should be taken to protect the neighboring parts from the action of the caustics. The use of carbolic acid is followed by a little secretion, and is less painful than nitric acid, which causes sharp inflammatory reaction. After cauterization the ulcer is treated like any other granulating surface. Iodoform in private practice is objectionable because of its odor. Iodol, europhen, bismuth subiodid have all been tried and discarded by Ravogli, who still uses aristol, but deems it inferior to iodoform. Gaylord has used with success a 10 to 40 per cent. solution of formalin as an escharotic. Strong applications of this kind, however, have been generally abandoned since the advent of iodoform. A 6 to 8 per cent. solution of sulphate of copper stimulates granulation. If the ulcer is sluggish in healing it may be curetted. A well-regulated diet, improved hygiene, stimulants, and tonics are indicated in old rundown cases. Opiates are sometimes needed for pain, although hot water containing a little potassium permanganate or mercury bichlorid, used in compresses, may be sufficient to allay the pain and to change an unhealthy to a healthy surface.

The same principles apply to the treatment of chancroid of the breast.

CHAPTER V

STREPTOCOCCUS INFECTION OF THE GENITOURINARY TRACTS OF WOMEN

Streptococci have a common morphology, depending upon the fact that, after the cocci have multiplied by binary division in a single direction, the resulting segments arrange themselves into chains. The chains thus formed may be long or short, single or arranged into bundles. While there are numerous varieties of streptococci, it is necessary in this chapter to consider only the *Streptococcus pyogenes*, in which the cocci are spherical—from 0.1 μ to 1 μ in diameter—those in the same chain or in different chains varying in diameter. This streptococcus grows both in the presence and absence of oxygen and does not liquefy gelatin. Considered pathogenetically it causes inflammation when injected into the tissues of lower animals, in some of which, notably in mice, with lowered vitality it multiplies within the body and causes death. It is demonstrated to be the essential causative factor in erysipelas, from which fact it is sometimes designated the *Streptococcus erysipelatus*. It is also recognized as the streptococcus of puerperal fever, a fact which explains the now universally recognized causal relation of erysipelas to the latter disease. Czerniewski found this coccus but once in the lochia of 57 healthy lying-in women, while he found it in the lochia of 35 out of 38 women with puerperal fever, and in 10 fatal cases it was present in the lochia before and in the organs after death. The inference from these observations has been abundantly confirmed, especially by Clivio, Widal, Eiselberg, Emerich, and Bumm. It also plays an important part in the inflammation of mucous membranes.

PATHOLOGY OF STREPTOCOCCUS INFECTION

The streptococcus is always to be found on the vulva and in the adult vagina of healthy women. Its presence there is without significance, until, by some fortuitous circumstance, it finds a lodgment beneath the epithelium of the vulva, the vagina, or the uterus. Then, if the resistance on the part of the tissues and the leukocytes is not sufficient to destroy it and thus prevent its further ravages, it speedily deve local changes and constitutional manifestations that are characteri

It multiplies with extreme rapidity in the cutaneous, cellular, muscular structures in which it happens to become active. This pro is at once associated with the local heat, pain, redness, and swel characteristic of acute inflammation. In some cases the general local resistance are sufficient to arrest the process. In many cases area of inflammation rapidly extends. In other cases the local acti speedily becomes limited in area, while constitutional symptoms bec pronounced.

These symptoms are at first a chill, followed by high temperat (103° to 105° F.), rapid and full pulse, headache, hebetude, loss appetite, sometimes associated with nausea and vomiting. Then temperature suddenly falls, associated or not with rigor, only to again as high as or higher than it was before. This vacillation of temp ature may occur at any time, its characteristic feature being compl loss of rhythm.

At first, the pulse in both rapidity and force may go up and do with the temperature. A little later, however, this correlation cea As the case progresses, the temperature goes higher and stays high while the pulse increases in frequency and loses in force. Delirium w tremulousness now sets in. Suddenly the temperature goes bel normal; the pulse rate increases to 130, 140, and beyond, while volume and force are scarcely perceptible. Delirium now merges i unconsciousness and the patient dies of exhaustion. This is a br sketch of the varying possibilities of an infection that is never tri but may be tragic.

PATHOLOGY OF STREPTOCOCCUS INFECTION OF THE EXTERN GENITAL ORGANS

(Erysipelas of the Vulva and Vagina)

The infection, i. e., the streptococci, always present on the surf of the vagina, finds ingress through some abrasion in the epitheli This point serves as the focus for the rapid propagation of the mic organism. All the histologic phenomena of inflammation—dilu capillaries, blood stasis, serous exudation, migration of leukocyte are speedily manifested. As a rule this process is so intense, that carefully inspected, minute vesicles may be discovered, usually arran in groups, and manifesting themselves in the surface of the skin. smaller of these vesicles commonly rupture, the resulting discharge clear or slightly yellowish serum, occasionally tinged with blood, de cates, and forms crusts. The characteristic feature of this inflammat is to spread rapidly from the point of primary infection. This extension may occur until it involves not only the pudendal structure, lower part of the abdomen, and the inner aspect of the thighs, but it may extend upward into the vagina; it may, indeed, assume the type of "wandering" erysipelas, and invade practically the entire surface of the body before it is arrested. The subcutaneous infection may result in the formation of foci of suppuration, manifesting themselves on the surface of the skin in the form of large purulent blebs, or, if more deeply seated, as fluctuating masses.

PATHOLOGY OF STREPTOCOCCUS INFECTION OF THE UTERUS

(Puerperal Infection)

Streptococcus infection of the uterus, or "erysipelas of the uterus," may occur in (a) the non-pregnant, (b) the pregnant, and (c) the parturient uterus.

Any agent that may at once serve as the carrier of the streptococci and convert the uterus into an infection atrium may serve as the active cause of the condition.

(a) Infection of the non-pregnant uterus occurs generally as the result of injudicious or even criminal instrumentation. The examination of the uterus with the unclean sound—and no sound can be surgically clean when it reaches the uterine cavity—has been the frequent cause of infection. The old practice of introducing a sound and turning it to reduce a dislocated uterus—a practice that I am sorry to say is not yet obsolete—inflicts sufficient violence to break the epithelium, and thus make an opening for the easy inoculation of the patient with streptococci that have been carried in from the cervical canal, or from the vagina. The fatalities following this practice have led to its abandonment by all intelligent and conscientious physicians. The most frequent cause of infection of the non-pregnant uterus is in the case of women who imagine themselves pregnant, and either attempt to induce an abortion on themselves, or get some filthy professional abortionist to undertake it for them.

(b) The method of causation and the changes in the endometrium and in the parenchyma of the uterus are not essentially different from those in the non-pregnant and the parturient uterus, and will be considered in detail in the latter connection. The presence of the fruits of conception in the uterus, however, is a modifying circumstance of importance. With further development inhibited by the injury inflicted, and with its vitality ended, it speedily becomes an effective culture medium for the propagation of the streptococci or other infectious organisms. The almost invariable wounding of the endometrium under such circumstances affords an avenue of entrance. But in addition to this, the site of placental or omental implantation shortly affords another such opening. If, therefore, the fetus, sac, and placenta are not speedily removed they become sources of infection. Chills occur, the temperature rises, there is tenderness over the lower abdomen, and the discharge from the uterus becomes offensive. It is now apparent that, independently of preliminary streptococcus infection, putrefactive changes are in progress. Under such circumstances the uterus should be emptied by curettage, which will be considered in connection with treatment under the next section of this subject, viz., Puerperal Infection.

(c) Streptococcus infection of the parturient or the immediately post-parturient uterus is always a circumstance of tragic possibilities.

It is probable that every case of puerperal infection—a better term than "puerperal fever" or "child-bed fever"—is an instance of mixed infection. It is true, however, that in every instance the *Streptococcus pyogenes* is present, and that in the great majority of them it is responsible for the clinical phenomena. Clivio and Monti demonstrated its presence in five cases of puerperal peritonitis; Widal found it in sixteen; Czerniewski found it in the lochia of thirty-five out of eighty-one women with puerperal fever. Bumm was able to find the streptococci alone in five cases (three of these ending fatally). In twelve cases, besides the streptococci, there were observed upon the plate cultures staphylococci and other germs. In eight cases the number of germs of decomposition were very great (mixed form of septic and putrid endometritis). Two of these cases terminated fatally, the streptococci entering the venous thrombi at the placental site and a pyemia resulting.

Occasionally we may find pyogenic staphylococci, especially the aureus, besides the streptococci. Bumm only observed staphylococci alone in two cases. The cases were mild ones, and this coincides with the observations of Fehling.

The changes induced by the *Streptococcus pyogenes* in puerperal cases are both (a) local and (b) constitutional.

(a) The local changes are restricted primarily to (1) the uterus, (2) the pelvic lymphatics, and (3) the uterine adnexa.

The uterus at the time of delivery and immediately after is in an ideal condition to favor infection. The microorganism, introduced into the vagina or uterus by the finger of the accoucheur or upon instruments employed in delivery, finds in the fluid contents of the uterus a congenial culture medium in which it propagates with great rapidity. The placental site serves as an enormous infection atrium, the wide, distended lymphatics and the open blood vessels alike serving as portals for the reception of the poison, which is speedily transported thence to the general system.

In the uterine structure, however, is manifested the characteristic action of the streptococci. As soon as they invade the vessels of the uterus they produce changes which break down the endothelium and result in the development of a thrombus. After a while the thrombus in turn breaks down, and the emboli thus formed spread the organisms in various directions. Many of them lodge in the immediately adjacent vessels of the myometrium, while others, gaining access to the systemic circulations, sanguiferous and lymphatic, are conveyed to distant organs and structures, where they become foci of secondary suppuration.

In the uterus itself there are speedily established foci of suppuration, by which the organ may become converted into what may be described as an aggregation of small abscesses. The individual accumulations of pus may vary from a few drops to a dram or even more. Occasionally two or more of these centers of suppuration may coalesce, forming a larger abscess cavity in the uterine wall.

This is a point in pathology that has an important bearing in treatment. In that connection it should be borne in mind that these suppurative changes occur in the myometrium, and that the condition is essentially one of interstitial suppurative metritis. The invasion of the lymph spaces by the streptococcus results very speedily in the development of an acute septic lymphangitis, involving the lymphatics, first of the pelvis and subsequently of the remoter parts of the system. The lymphatic glands may themselves become foci of suppuration. It should be remembered, however, that the streptococci do not produce suppuration so promptly as do the staphylococci, and that consequently, in the cases under consideration, pus does not appear in the uterine structures at once. In the earlier stages of the infection there occurs simply a diffuse infiltration of the tissues, which, if incised, will set free a clear yellowish fluid in which are a few pus cells. As the streptococci develop, however, they manifest their characteristic effect of producing a coagulation necrosis, which becomes the focus of suppuration. In the course of a few days a parturient uterus which is the seat of this infection may vary in length from 15 to 18 cm., and in fundal width from 12 to 15 cm. The uterine wall at the fundus is about 3 cm. in thickness. When cut open the interior of the uterus above the cervical canal is covered with a dark tenacious mucus, which is very offensive. The placental site is distinct, and may contain fragments of firmly attached placenta. The incised myometrium, as in Cartledge's cases, reveals numerous small discrete abscesses, varying in size from a millet seed to a large pea. This description of the general macroscopical appearance is based upon examination of the uterus removed by vaginal hysterectomy during the course of the disease, and does not, therefore, depend upon post-mortem changes for any of the peculiarities recorded.

Vidal, followed by Bumm, investigated a series of these cases. They agree that the endometrium is the avenue of ingress for the pathogenic microorganisms that cause the disease. From the endometrium they enter the system in two ways, viz.: first, through venous thrombi, which carry them directly into the circulation, and, secondly, through the lymph channels, where they may either lodge in the lymphatic glands themselves or develop foci of suppuration in connective tissue. Kehrer classifies puerperal endometritis into putrid and septic. In putrid endometritis he asserts that saprophytic microorganisms cause a change in the decidua, in which septic germs do not develop. This change, he contends, affects only the uppermost layer of the decidua, which is exfoliated as the new mucous membrane forms beneath it. These changes, he considers, are manifested by fever and other symptoms of intoxication and due to decomposition. Kehrer, however, admits that saprophytic infection is exceedingly rare, and that in the majority of cases of endometritis following abortions and labors bacteriological examination reveals the presence of septic microorganisms, especially streptococci, and sometimes pyogenic staphylococci, so that, as already contended in this chapter, the cases are in reality examples of mixed infection.

In so-called putrid endometritis, in which, notwithstanding the presence of streptococci, a predominating influence seemed to be exercised by the saprophytes, the following histologic conditions have been observed: the superficial layer of the decidua was filled with microorganisms, among which were all forms of rods, long threads, and cocci of all sizes. Fungi were found growing in colonies entirely covering the base of the decidua. The tissues were found in a state of necrosis, glassy and cloudy, at a point 0.1 mm. beyond the area occupied by the fungi. The granules could not be stained. Beyond the zone of infection a zone of cellular infiltration had formed. Numerous small round cells were observed, which looked like colorless blood corpuscles and formed a layer 0.3 to 0.5 mm. thick; they were lying close together. The zone cellular infiltration occupied a position between the superficial area of infection and the muscularis. The fibers of the myometrium, however, were found occasionally to be separated in places by an accumulation of cells, but this condition did not penetrate deeply into the muscularis.

The round-celled infiltration, according to Bumm, must be looked upon as an effort on the part of nature to set up a granular wall to act as a barrier against the entrance of the germs, and thus to separate the dead from the healthy tissue. The fact, however, that neither Bumm nor Kehrer have succeeded in demonstrating the existence of this so-called putrid endometritis independently of the existence of streptococci in large, if not in preponderating, numbers indicates that the effort to establish a variety of infection depending upon the existence and the action of the saprophytes is not warranted by the facts. This becomes the more apparent when consideration is given to the histological appearances of what Kehrer and Bumm designate as septic endometritis. The mucous membrane in these cases is necrotic and reveals the remains of the spongy layer thoroughly covered with streptococci yielding pure cultures. The cocci occur in thin layers, while in other places they appear as large colonies occupying considerable areas. There is a reaction zone, less pronounced but none the less persisting, just as defined as in the putrid variety. The protection, however, thus afforded seems to be less complete, as there are fewer round cells, and the necrotic zone disappears into the neighboring tissues without showing any sharply defined boundary. In these situations the streptococci grow and penetrate deeply into and through the striæ of the myometrium. The muscular tissue itself reveals an opacity in the presence of large accumulations of cocci. Where these accumulations occur they are surrounded by small collections of round cells; in some places the lymph spaces are filled with cocci, while at the placental site the venous spaces are closed and contain neither thrombi nor cocci. A few venous branches near the surface, however, contain blood clots which inclose a few of the cocci. An extension of the infection from the surface into the lymph spaces is demonstrable in numerous sections. Some of the finer lymph spaces show a delicate fungus border on their walls, while others are empty or filled with granular material. When the infection occurs within the lymph channel it does not seem to provoke reaction in the surrounding structures. In other locations the lymph spaces are filled with fungi, while the cocci are observed in the surrounding tissues. In still other places the lymph channels are filled with cocci, whence the fungi spread beyond the necrotic muscular layer, provoking a reactionary accumulation of cells in the adjacent tissues. The inflammation thus centering about different foci may result in the liquefaction of the entire infected mass, changing it into an abscess cavity. Bumm raises the important question: How can we explain the fact that the affection sometimes remains local, while in other cases it invades the lymph channels or the veins? His answer is that the bacteria must explain this. They are beyond question the agents which produce this form of disease. The danger exists not in their number, but in their virulence.

In making this statement he simply emphasizes the observations o Vidal and Chantemesse.

In the local septic infection and in the thrombotic forms the germs are only mildly virulent, and are made harmless by the speedy reaction that occurs in the organism. On the other hand, the extremely virulent germs penetrate the walls of the uterus and there is no local reaction. The germs occurring in the lymphatic form he would place midway in virulence, between the extremely virulent, or, as he expresses it, the internal, puerperal erysipelatous form, and the mild, local, or thrombotic forms. In view of these facts and of the practical identity in character, if not in degree, of the pathologic changes, and in view of the demonstrated common etiology, all of which is at least inferentially admitted by Bumm, there can hardly be said to exist any substantial reason for discriminating between the different varieties of infection as they are manifested in puerperal fever.

On the other hand, the evidence seems to be cumulative that this infection should be recognized as depending essentially upon the *Streptococcus pyogenes,* and that occasional modifications due to the presence, in varying proportion, of saprophytes and other microorganisms should be recognized as incidental rather than essential variations.

PATHOLOGY OF STREPTOCOCCUS INFECTION OF THE PELVIC PERITONEUM

It is important to remember that infection which may invade t lymph channels may travel through those highways to the peritone surface, occasioning thereby a true infection of the peritoneum. It h been stated that in parenchymatous suppuration of the uterus the i fection may penetrate directly through the tissues to the peritone surface; but, be this as it may, the fact remains that streptococc infection of the interior of the uterus is speedily followed in ma cases by involvement of the peritoneum. When infection of the pe toneum takes place the serous secretion, which is copiously thrown ou becomes a culture medium for the rapid reproduction of the strept cocci, which are rapidly absorbed thence by the numerous stomata the peritoneum. *Puerperal peritonitis* is, therefore, always associat with profound systemic intoxication. Another avenue by which the i fection may reach the peritoneum is that of the Fallopian tube, whic is frequently invaded by the progressive contamination of contiguo mucous surfaces. As a rule, however, the moment that septic inflan mation is established within the Fallopian tube the distal or fimbriat extremity becomes sealed, thus converting the tube into a sort of r tention cyst. Leakages may occur, however, particularly when th tubal distention has resulted in rupture.

PATHOLOGY OF STREPTOCOCCUS INFECTION OF THE FALLOPIAN TUBES

Infection of the Fallopian tubes by the *Streptococcus pyogenes* may be either (a) acute or (b) chronic.

Acute infection of the tubes by this microorganism is always secondary to a similar infection of the uterus. Although the infection may be mixed, the streptococcus is the determining factor.

Chronic infection of the tubes by streptococci may or may not be secondary to a similar infection, acute or chronic, of the uterus. In other words, it would seem that the infection may reach the intima of the tubes by some other route than the mucosa. In cases of chronic salpingitis, in which streptococci are found generally in connection with other microorganisms, they seem to play a subordinate rôle. Reymond and Magill, in their masterly contribution upon this subject, state that they found the streptococcus in these cases only with difficulty. It would not respond to the culture tests made with ordinary media until after it had been revitalized, as it were, by successive inoculations. It would seem that the diminution in the virulence of the microorganisms in some of these cases accounts for the chronicity of symptoms following their entrance into the tubes. These authors, in a number of their cases, were unable to detect the presence of streptococci until after they had made repeated observations in cases which would ordinarily have been designated as sterile salpingitis.

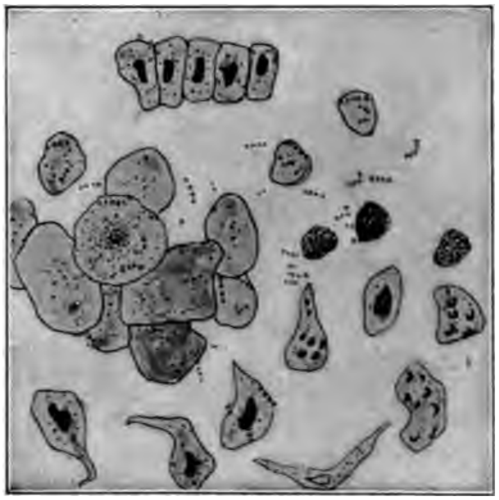


FIG. 271.—A SLIDE MOUNTED WITH PUS OF STREPTOCOCCUS SALPINGITIS FROM ONE OF REYMOND'S CASES.

The tubes in these cases always contain pus, which in turn contains a relatively small number of leukocytes, but a great quantity of eliminated deformed epithelial cells, whose perinuclear protoplasm has often been lost. There are also present cells from a deeper layer, which seem to have fallen from the frame of the fringes. The streptococci are rarely in the leukocytes, more frequently in the epithelial cells, but most frequently between the cells. A slide mounted with the pus of streptococcus salpingitis from one of Reymond's cases (Fig. 271) showed desquamated epithelial cells, sometimes without their nuclei, connective-tissue cells, granular fatty degeneration, and numerous streptococci. The microbes are sometimes strung out in long chains, while in other cases they appear as diplococci, or as chains of three links, each one slightly elongated.

The mucosa is generally found at the beginning of the affection to have undergone but slight modification. The epithelial cells are yet in position and have retained to an important extent their cilia, the fimbriæ alone being a little thickened and infiltrated with leukocytes. In recent infection the streptococci are found in the caliber of the tube, while, according to Bumm, the streptococci throng about the epithelium of the pavilion, although they do not infest the caliber of the tube at its uterine third. It is inferred from this that the microorganisms must have traveled over some other highway than that of the lumen of the tube itself to have reached the vestibule. At a later period of the salpingitis, if the lumen remains open, the mucosa shows lesions of relatively less gravity than are manifested in the other tissues. The lymphatic situated in the center of each fimbria is greatly dilated and contains leukocytes and streptococci. The epithelium, in places while almost intact, is not provided with vibratile cilia. At certain points groups of streptococci are found beneath superimposed layers of epithelium, which is occasionally detached *en bloc*, leaving the fimbriæ denuded. The tissues underlying this denuded area are found more or less infiltrated with streptococci. These changes in the epithelium explain the presence of the detached epithelial cells in the pus. It is noticed that in streptococcus infection the superficial cell is not attacked by its free surface, as in gonorrheal salpingitis, but that the invasion comes from the deep surface. This is an essential distinguishing point in the pathology of the two infections. As a result of this assault upon the epithelial cells from their basement membrane they fall in masses, and not singly, as is the case in the presence

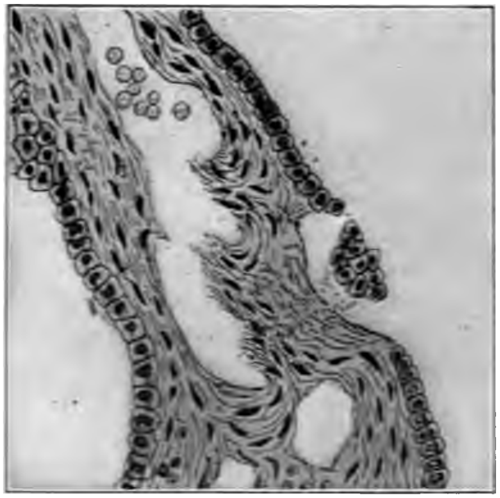


FIG. 272.—A SECTION OF FIMBRIAE FROM A CASE OF STREPTOCOCCUS SALPINGITIS BY REYMOND AND MAGILL.

of gonococcus infection. This desquamation, say Reymond and Magill, is so abundant as entirely to fill the caliber of the tube with the detached cells, which mass together and can be clearly distinguished from the fringes in a section.

In the peripheral blood vessels are sometimes noticed thrombi containing streptococci; at other times the endothelium of the vessels is seen to send out promontories into their lumen, and here are found streptococci both within and without the free passage of the vessels. These changes are all graphically shown in a section of a fimbria in streptococcus salpingitis by Reymond and Magill (Fig. 272). These observers find in the relation of the streptococci to the vessels in these cases confirmation of the conclusion of Labadie-Lagrave to the effect that "upon the blood is imposed the duty of destroying and attenuating the streptococcus." The microorganism is found, particularly at the beginning, scattered through the cellular tissue of the aileron, and in the subperitoneal tissue also, as the adhesion is formed with the tube or the ovary. An abundant cellular infiltration is formed beneath the serosa, whose disappearance leaves a point still marked by a group of leukocytes mixed with streptococci, which are also found in cellular infiltrations between the sheaths of the muscles.

PATHOLOGY OF STREPTOCOCCUS INFECTION OF THE OVARIES

Streptococcus infection of the ovaries rarely, if ever, exists as a primary or even as an independent condition. It is always preceded by a more or less active infection of the vagina or uterus. In these cases the bacteria reach the ovaries through the avenues of the lymphatics and blood vessels, by which they are distributed directly to the parenchyma and inaugurate their activities by the development of small miliary abscesses. A section of ovarian stroma will show a small abscess cavity, the pus of which abounds in streptococci, and the surrounding stroma will be studded with migrated leukocytes. Sooner or later small segments of ovarian tissue become detached and are found in the pus of the gradually enlarging abscess cavity. Such detached segments of tissue will show it to be studded with streptococci. These abscesses may develop at any point from the center to the circumference of the ovary, even in its wall. They form irregular cavities, and are consequently liable to be mistaken for purulent cysts. In many cases, however, there is no difficulty in establishing their real character. Several foci of suppuration may be simultaneously established, resulting in the coalescence of their cavities and the consequent development of one relatively large abscess. An ovary that is the seat of this form of infection is very liable to become adherent to its neighboring Fallopian tube. A remnant of necrotic partition may be observed in some cases between coalescing pus cavities. The suppurating cavity in the ovary, however, is generally separated from the purulent accumulation within the tube by a barrier of formed tissue, which may itself be the field of more or less diffuse infection by the streptococcus, and melt down to form a wide communication between the tubal and ovarian abscess cavity. A streptococcus infection of the ovary may, however, result in abscess of that organ to its complete destruction without the formation of pus in the tubes, and with the tissue between the two entirely intact.

It is obvious that this infection may be either (a) acute or (b) chronic in its clinical manifestations.

SYMPTOMS AND DIAGNOSIS OF STREPTOCOCCUS INFECTION

SYMPTOMS AND DIAGNOSIS OF STREPTOCOCCUS INFECTION OF THE VULVA AND VAGINA

The point of invasion becomes slightly sensitive to the touch, but has a sense of burning, slight at first, but increasing in severity. If inspected at this time the spot of infection, limited in area, will be found red, slightly elevated, and puffy. A rigor that may be slight or severe ushers in the constitutional symptoms. The tongue becomes coated; there is a sense of depression over the stomach, and malaise, with possible nocturnal delirium; swelling of the infected point occurs, associated sooner or later with generally coincident tenderness in the inguinal lymphatics. The swelling in the vulva progresses rapidly and is associated with pain, throbbing, and a sense of heat and dryness; itching is generally an early and persistent symptom, while diffuse infiltration occasioning edema of the cellular tissue of the vulva rapidly supervenes. The diagnosis is based upon the symptoms just given and upon a careful consideration of the pathologic features already given.

SYMPTOMS AND DIAGNOSIS OF STREPTOCOCCUS INFECTION OF THE UTERUS

(*Puerperal Infection*)

The symptoms of puerperal infection begin with a chill, which may or may not be preceded by fever. The temperature reaction, however, which follows the initial chill is generally severe. The lochia, which up to this time may have been normal in quantity, color, odor, and consistence, are temporarily checked, become darker in color, more viscid, and have an offensive odor. The thermic range now becomes characteristically irregular. Another chill, which may be either slight or severe, is followed by a profuse perspiration, generally of a clammy character, succeeded by marked exhaustion. The chills now become irregular, recurring either daily or sometimes skipping a day, in which case two or three chills may occur in the course of 12 to 24 hours, being then followed by another interval of immunity. The chills are, however, more prone to occur during the evening or the night than in the morning or afternoon. The fever curve may show an evening exacerbation followed by a morning remission, as in certain forms of malarial toxemia, but, as a rule, the vacillation is of a very lawless kind. As a rule, the first febrile manifestation amounts to three or four degrees; after this there is a slight remission involving a drop of one or two degrees; then a slight rise and a slight fall. The rise rarely reaches the original elevation and the fall never approximates the normal line. In the course of eight or nine days, however, it will be discovered that the vacillations are a little more pronounced, i. e., the elevations are a little higher and the depressions a little lower than formerly, while the vacillations occur with greater frequency than before. There seems to be a constant tendency for the highest and lowest points to get farther and farther apart. There are, of course, individual exceptions to the rule just given. In the presence of a particularly virulent infection the initial chill may be very profound, the elevation of temperature may be high and may so continue during the course of the disease, showing but very slight remissions. The cardiac centers are early influenced by the infection, the pulse rising to 120 or higher, and being generally soft and compressible. The respiration is rapid, the tongue speedily becomes coated, generally with a white fur, though ordinarily moist. There is not, as a rule, marked disturbance of digestion, particularly to the degree which occurs in septicemia. As the disease advances, however, the patient becomes emaciated and anxious, and delirium may supervene, although in some cases the intelligence remains intact until a short time before death.

The *diagnosis* of streptococcus infection of the uterus is made first by a careful estimation of the preceding symptoms, and subsequently by detection of the streptococcus. A curette or a curette forceps may be passed into the uterus, when some of the débris of degeneration can be removed. Microscopic and cultural examination of the scrapings will reveal the presence of the *Streptococcus pyogenes*, but in association perhaps with other microorganisms. It will, however, be found in such preponderating numbers that the essential character of the infection can not be mistaken.

SYMPTOMS AND DIAGNOSIS OF STREPTOCOCCUS INFECTION OF THE FALLOPIAN TUBES

In acute infection the symptoms are marked by those of infection of the uterus, which is always an antecedent and concomitant condition (see Symptoms and Diagnosis of Streptococcus Infection of the Uterus).

In chronic infection the symptoms are more or less pain in the lower zone of the abdomen, with a tendency to focus in the ovarian regions. There may be occasional disturbances of temperature manifested at times by chills, followed by fever. These attacks are irregular in their occurrence, and, in the midst of an attack, the vacillations of temperature are erratic. Sexual intercourse is painful and often intolerable. Physical examination at this time reveals painful tumefaction in the pelvis. The patient shrinks from the least touch. A mass is readily felt at either side of the uterus, displacing it laterally; in other cases the mass seems retrouterine, while in still others it occupies the whole pelvis, pushing the uterus into extreme anteflexion. In such cases there are always more or less pain and irritability of the bladder, and complaints are made of pain in the sacral and lumbar regions and extending down the thighs.

The general symptomatology of streptococcus infection of the Fallopian tubes, acute and chronic, is to be studied in the light of the fact that, in the chain of morbid events, the acute invasion of the tubes always occurs secondarily to invasion of the uterus. While this is true, an equally important fact to be remembered is that invasion of the tubes occurs so promptly after the primary infection of the uterus that the symptomatology of the two conditions is, in the majority of cases, essentially coincident. It is only in those cases in which the microorganisms seem to have a diminished virulence, and in which the symptoms of uterine infection have subsided, that there are presented any distinct signs of involvement of the Fallopian tubes; for, in the presence of acute streptococcus infection of the uterus with associated involvement of the lymphatics and general engorgement of the pelvic tissues, the condition of the tubes is, as a rule, completely masked. The demonstrated existence of streptococcus infection of the uterus and of the surrounding structures may, however, be accepted of itself as a symptom of involvement of the tubes. It is true that in a limited number of cases this rule may fail, but even then it remains the safer guide for the treatment of the case.

The constitutional symptoms of this form of infection are, in effect, those of similar infection of the uterus (see Streptococcus Infection of the Uterus). In a few instances the diagnosis may be confirmed by palpation of the enlarged tubes by bimanual manipulation; but it should be remembered that this is a dangerous expedient, as even slight manipulation may result in forcing some of the virulent pus from the tube into the peritoneum. The use of the aspirating needle for diagnostic purposes in these acute cases is an even more dangerous procedure. The fact of a recent puerperal infection, the history of streptococcus invasion of the uterus, and the demonstrated existence of large tubes are facts upon which a presumptive diagnosis may safely be based. The isolation of the streptococcus by microscopic examination and by culture and inoculation experiments will clear up any remaining doubts as to the character of the disease.

SYMPTOMS AND DIAGNOSIS OF STREPTOCOCCUS INFECTION OF THE OVARIES

In acute infection, whether involving the surface of the ovary or its parenchyma, there is always extreme circulatory engorgement. This, in an inelastic structure such as the ovary, implies extreme pressure upon the terminal nerve filaments, and consequent extreme pain. This is especially marked when there are deep infection and consequent distention of the organ incident to suppuration. There is a sudden chill, followed by rise of temperature at the onset. The temperature soon defines a septic curve. The behavior occurs whether the attack is an initial one or whether it is a recrudescence after the subsidence of septic symptoms incident to previous infection of the uterus. Physical examination at this time reveals the ovaries so tender that they are intolerant of touch. The diagnosis is based upon the association of these symptoms with the previous history of the case.

In chronic streptococcus infection of the ovaries the initial process has stopped short of suppuration. Instead, as a rule, a periovarian exudate has become organized into a sort of adventitious and inelastic tunic. In consequence of these changes the symptoms are identical with those of chronic ovaritis due to gonococcus infection (see Symptoms of Gonococcus Infection of the Ovaries).

In a general consideration of the symptoms presented in these cases, acute or chronic, it is important to bear in mind the antecedent chain of morbid events. The infection having occurred primarily through some traumatism or abrasion in the uterus, generally in connection with parturition or the puerperium, the microorganisms may manifest their activity in the uterine muscularis, or they may find their way through the lymphatics into the surrounding cellular tissue; or they may continue their journey and invade the adnexa. The invasion may be arrested at any one of these three stages, or a given case may exemplify all three of the stages, and this occasionally with such rapidity that they may appear to be coincident. The virulence of the microorganisms and the susceptibility of the patient are the two factors which determine the clinical conduct of the infection at the various stages of its invasion. Thus, an infection of the uterine wall may be arrested, either spontaneously or by treatment, and resolution may follow, or active suppuration may develop. A similar infection of the circumuterine tissues may have a similarly variable course, and the same may be true of the appendages. The interval between either of these progressive stages of invasion may be of variable length. It thus happens that the streptococcus infection of the uterine appendages may develop remotely in point of time from the original infection, or it may be practically a simultaneous occurrence. In any event the history of the case and the revelations of histological examination will alike show that the invasion has taken place through one or the other or both of the circulatory media.

It is entirely apparent that the ovarian lesion is only a part of the clinical picture presented by such a streptococcus infection. The lesions in the uterus and the Fallopian tubes have been previously described; yet it seems desirable to call attention at this point to the severe "perioöphoritis" that occurs in these cases. A variable degree of peritonitis is always set up which results in the destruction of the peritoneum in large deposits of fibrin, and in adhesions that bind down the ovary to surrounding organs, until it is so completely covered in that its liberation becomes one of the most difficult operations of the surgeon, and can only be accomplished by actual dissection, which leaves a raw cavity. In fact, the symptoms from which the patient suffers after the subsidence of a pelvic peritonitis are explained almost wholly by this perioöphoritis with the accompanying adhesions.

TREATMENT OF STREPTOCOCCUS INFECTION

TREATMENT OF STREPTOCOCCUS INFECTION OF THE VULVA AND VAGINA

(*Erysipelas of the Vulva and Vagina*)

The treatment should be promptly applied. The vulval hair should be scissored short. If the area is slight I have treated this infection successfully by injecting it hypodermatically with a 0.3 per cent. solution of formaldehyd, taking care to go deep enough to reach the cellular tissue. Two or three such injections may be required to bring the whole area under control. The object is, of course, to destroy the infection and with it the area of tissue already infected, and thus abort the attack. Under this treatment the tissues speedily shrivel and a dry, hard eschar presently drops out. It is obvious that this remedy is not available when the area of infection has already become extensive, and that it would not be available in localities where the resulting cicatrization is a matter of any concern.

When it has already extended too far for the formaldehyd treatment the progress of the infection may be circumscribed by multiple subcutaneous injections of 5 per cent. solution of carbolic acid. Of the external remedies ichthyol in glycerin and carbolic acid in solution with liquid vaselin, painted on the surface with a soft brush, have the merit of being both convenient and effective. While the disease is yet limited to the vulva a 5 per cent. solution may be employed; but when the infection involves a greater area a solution of not more than 1 per cent. should be used. Creolin and phenol are really but milder forms of the same treatment.

Concentrated solutions of salicylic acid and of sulphocarbolate of soda, respectively, have been employed subcutaneously around the circumference of the infected area. Comfort is derived from any soft, soothing application which will protect the inflamed surface from the air. Silk saturated with carbolized liquid vaselin or with carbolized vegetable oils is a source of comfort, care being taken to maintain, as nearly as possible, an equable temperature in the parts.

TREATMENT OF STREPTOCOCCUS INFECTION OF THE UTERUS

(*Puerperal Infection*)

The first object in treatment is to arrest the infection, if possible, at its point of entrance. The first step in this direction is suggested by the pathology as already given. The first signs of temperature disturbance, whether an initial chill followed by fever or an initial pyrexia without a chill, associated with a change in the quantity, color, and odor of the lochia, should be the signal for a careful exploration of the uterus. If from examination the fact is determined that the symptoms are of intrauterine origin there should be no hesitancy in practicing thorough curettement under the most rigorous antiseptic precautions. With reference to the use of the curette under these circumstances much unnecessary dispute has arisen. Those who question the expediency of its employment apparently fail to take into account either the character of the infection or the primary pathologic changes which it induces. The formation of thrombi in the orifices of the veins in the placental site is of itself sufficient materially to diminish the outflow of fluid from that source; while the inflammatory exudation arrests the free escape of serous elements from the intervenous areas. At this juncture nature is found in the act of rallying her resources to repel the invader, and there may be said to be a temporary check in the course of the infection. This is precisely the time when treatment, to be of the most value, should be applied with the most thoroughness.

[illegible] OF THE [illegible]TERUS IN PUER[illegible]

[illegible] recumbent posture [illegible] adjusted, and [illegible] solution.

[illegible] e introduced to [illegible]

[illegible] with a mechani[illegible] the tissues are fragile [illegible]

[illegible] gently introduced [illegible]

[illegible] the uterine wall [illegible]

[illegible] with normal salt [illegible]

[illegible] with [illegible] per cent. [illegible] three to five minutes,

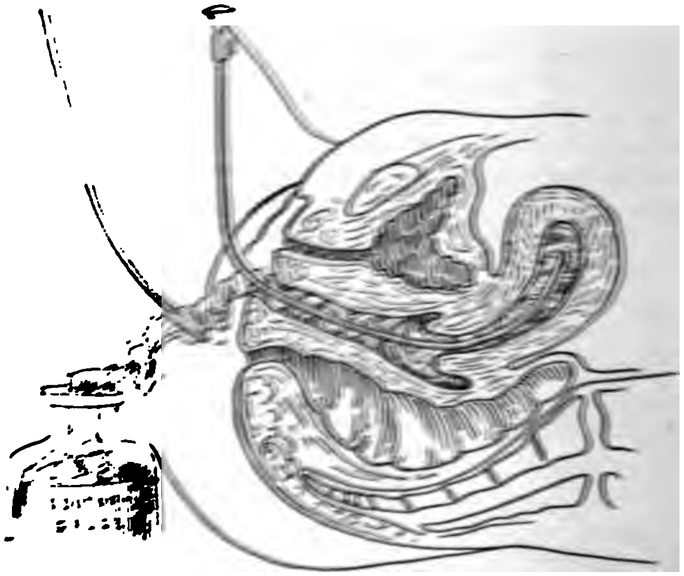


FIG. [illegible] [illegible] INTRA-UTERINE IRRIGATION.

[illegible] for a similar length [illegible]

[illegible] with a long ribbon of gauze [illegible] in glycerin, to the lower end of which, for convenience in removing, a strand of silkworm gut has been attached.

(9) The ichthyol pack is removed after 24 hours, and after irrigation with normal salt solution another is applied.

For continuous drainage Ill carries an irrigation tube to the fundus of the uterus and packs it with gauze which he uses for efferent drainage (Fig. 273).

If the patient begins to improve from the start under this treatment the packing may be repeated daily until all symptoms disappear. If, however, in spite of these precautions, the temperature continues to vacillate and to show a characteristic pyemic range, and particularly if the pulse goes to 120, with a tendency to increase in frequency and to diminish in force and volume, the evidence is to be construed as meaning that the infection has invaded the lymph channels, and that the myometrium has become the seat of diffuse infection, if not of multiple suppurations. It is manifest that under these circumstances the disease has passed beyond the control of such a conservative measure as curettement. The condition indicated by this persistence of symptoms is one which, if left alone, is calculated constantly and progressively to reinforce the systemic infection, and thereby to keep alive a pyemic state which must result in death. An intelligent comprehension of the symptoms and of the underlying pathologic conditions can not result in any other conviction than that the line of treatment must be *complete removal of the uterus.* Successful cases of this character have been reported by Vineberg, Cartledge, and others. The operation may be done either through the vagina or by abdominal section, although the latter is the preferable route (see Procedure for Hysterectomy).

The suggestion has been made that, in view of the probable upward extension of the infection in puerperal fever, and of the consequent involvement of the Fallopian tubes, a sound should be passed through the uterine cavity and the orifice of the tube for the purpose of drainage; some, indeed, have gone so far as to suggest the expediency of irrigating the Fallopian tubes (see Infections of the Fallopian Tubes). A method of this kind is unsurgical in the extreme, for the reasons, first, that no surgeon, however deft he may be, can be sure of the distention of the tube; and, next, that he can not distinguish the orifice of the tube within the uterine cavity in the post-parturient condition. The most that he will be likely to accomplish by the procedure is to establish a fresh infection atrium within the uterus.

Supporting treatment should be adopted from the start, care being taken to preserve the digestive functions, which happily are not, as a rule, seriously compromised in these cases. Stress has been laid upon alcohol as an article of diet, and the testimony seems to support the claims for its consideration. Whiskey may be given in the form of milk punch every few hours. Wines are not, as a rule, so well borne, and beer is more prone to disturb the gastric and other functions. Mild acidulous drinks are usually demanded to control the generally persistent thirst. The bowels should be kept relaxed, but active purgation should be avoided. The old theory of treating these cases with cathartics, to favor the elimination of the poison, is in the light of the now well-understood pathology a fallacious doctrine.

TREATMENT OF STREPTOCOCCUS INFECTION OF THE FALLOPIAN TUBES

If the involvement of the tubes can be demonstrated in these cases it is an imperative indication for their removal, as well as for the removal of the uterus (panhysterectomy) (see Procedure for Panhysterectomy).

Chronic infection of the Fallopian tubes by streptococci is to be recognized and treated simply as "pus tubes" (see Treatment of Gonococcus Infection of the Fallopian Tubes).

TREATMENT OF STREPTOCOCCUS INFECTION OF THE OVARIES

The treatment of streptococcus infection of the ovaries, whether acute or chronic, should be addressed to saving one or both functions of the diseased organ, namely, the function of ovulation and the function of furnishing an internal secretion. The former may have been entirely destroyed by the results of the perioöphoritis and the organization of the resulting tunic; both may have been hopelessly destroyed by suppuration of the parenchyma. The loss of the power to ovulate does not carry with it the loss of the power to furnish an internal secretion.

In acute ovaritis of streptococcus origin the disease is almost always secondary to and associated with similar infection of the uterus. It is, therefore, to be treated not as a special condition, but as a part of the general state of infection, usually puerperal (see Treatment of Streptococcus Infection of the Uterus).

In ovarian abscess, whether occurring as a feature of acute or chronic infection, the diseased organ is to be removed.

In chronic ovaritis, if there is a reasonable prospect of saving a portion of the uterus without leaving an intolerably painful condition, the effort should be made in all subjects under forty years of age. The conservation of even a small part of the ovary results in furnishing to the system sufficient ovarian secretion to maintain a certain balance in its nervous function. Under such circumstances the ovary should be resected. The hardened or atrophic or so-called cirrhotic portion should be cut away, leaving as much as possible of healthy stroma. If this should not furnish an organ for ovulation it will leave one susceptible of furnishing internal secretion for the harmonious working of the general economy. This operation should always be done with a distinct understanding with the patient as to its objects, purposes, and the possibilities that the remaining structure may be painful and demand a secondary operation for its removal.

115. PROCEDURE FOR RESECTION OF THE OVARY

(1) The ovary is brought into the field of operation through an ample median abdominal incision.

(2) The cirrhotic area is cut away in a wedge-shaped piece.

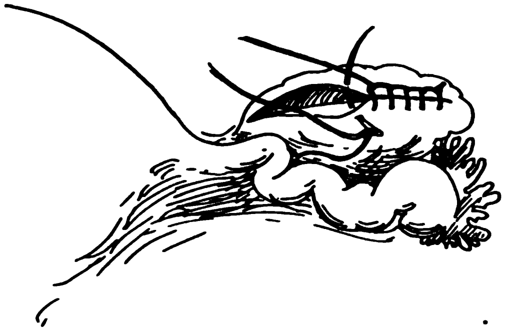


FIG. 274.—(115) PROCEDURE FOR CONSERVATIVE RESECTION OF THE OVARY. The cirrhotic tissue has been cut away leaving enough healthy stroma with follicles to furnish internal secretion.

(3) If small cysts are seen in the remaining stroma they are destroyed by being touched with a small pointed actual cautery.

(4) The incision in the ovary is closed by continuous hemostatic suture (Fig. 274).

CHAPTER VI

TUBERCULOUS INFECTION OF THE GENITOURINARY TRACT IN WOMEN

The genital and urinary organs in women, including the pelvic peritoneum, are liable to infection by the *Bacillus tuberculosis.*

The *Bacillus tuberculosis* (Koch) consists of rods from 1.5 μ to 3.5 μ long and from 0.2 μ to 0.25 μ broad. They are generally slightly curved, but sometimes angulated, and in stained specimens exhibit unstained intervals. They are usually single, but are occasionally double. They are peculiar in that they do not readily take up anilin colors, and that when once stained they are not decolorized with facility, even by strong acids. They are parasites, but under ordinary circumstances they are not saprophytic. They grow only at a temperature of about 37° C. (98.6° F.), and that they develop spores in the process of growth is not established. Koch affirms that they are killed by exposure to the direct rays of light, although Sawizky states that tuberculous sputum, under the conditions of ordinary habitation, may retain infectious power for as long as ten weeks. A fact of practical importance is that they develop a toxin which produces febrile reaction. Pathogenetically it is sufficient for the present purpose to say that, introduced into the system, this bacillus causes tuberculosis both in the lower animals and man.

Any of the organs or structures indicated may be the seat of primary manifestation of the infection, or any or all of them may participate in a tuberculous infection of the general system.

PATHOLOGY OF TUBERCULOUS INFECTION

While I shall consider this infection with reference to its manifestation in the various genitourinary organs, it is of some importance to approach the subject with a few more general considerations. As Maylard has observed, the presence of the bacillus in some particular spot or tissue rather than in some other particular spot or tissue involves an intricate and interesting problem. The source of the bacillus, the portal of entrance into the body, the avenue of transmission to the internal structures, the conditions there favorable to its growth, and its final spread from that focus are interesting speculations that possess distinctly practical importance. These are the questions that are involved in the conflict, "a conflict between two forces, a conflict, too, which must be fought to the bitter end, to the complete defeat of one or the other combatant."

It is generally conceded that there are two chief ovaries of tuberculous infection, one human, the other bovine, the latter playing only a minor rôle in the propagation of the bacillus. The English Royal Tuberculosis Commission, after a full investigation, reported that "cow's milk containing bovine tubercle bacilli is clearly a cause of tuberculosis and of fatal tuberculosis in man." There is conclusive evidence that the tubercle bacilli found in different animals belong to identically the same species.

The consensus of opinion is that the bacilli are carried first through bacillus-infected discharges. The possibility of contaminating discharges should be recognized as existing, in kind if not in degree, in cases of pelvic or abdominopelvic tuberculosis quite as much as in tuberculosis of the lungs.

The method of ingress into the system, the determining force in effecting lodgment in particular structures, and the mechanism of dissemination from such foci will appear in connection with the further discussion of the subject.

PATHOLOGY OF TUBERCULOSIS OF THE VULVA

Tuberculosis of the vulva was formerly not recognized in the standard textbooks. The reported cases of Demme, Schenck, Karajan, Paoli, Kelly, Rieck, and many others would indicate that the disease is of relatively frequent occurrence, and that the probability of this infection must always enter into the diagnosis of vulvar ulcers.

Barbier has established the fact that a woman can be infected by a tuberculous man. Tubercle bacilli have been demonstrated in the semen of tuberculous subjects and in the discharge from tuberculous infection of the epididymis. A surgeon may infect a patient by carrying the bacilli on his finger or on unclean instruments. An infection atrium in the epithelium is necessary to complete the process of invasion.

The infection may occur among adults or children. Prostitutes are the most frequent victims.

The infection generally finds ingress, and its first local manifestation is in the region of the urethral orifice or the clitoris, or in the posterior commissure. The lesion begins, according to Whitacre, as a single or as multiple hard masses of a dark red or livid color, which develop in an indurated skin and increase in size very slowly. This mass may exist for a long time as a firm nodule, or in the clitoris as a hypertrophy, or it may soften in the center and break down to form a small, raised, unhealthy ulcer with ragged edges, which exudes a serous fluid. It is in this stage of ulceration that the patient usually presents herself for treatment. When the lesions are multiple a number of such discrete ulcers will form on the vulva and gradually run together to form an extensive area of tuberculous granulations, involving the entire vestibule, clitoris, labia, and lower part of the vagina. The granulations of such an ulcer are unhealthy, friable, do not bleed easily, and show no tendency to caseation. The surface is covered by a seropurulent exudate. There is a rich vascularization of the part, and the tissues around and beneath the ulcer are strongly infiltrated, but not markedly indurated. These ulcers are apt to be serpiginous in character, healing behind as the advance is made. A very characteristic feature of the disease is a rough, tense, hard elephantiasic thickening of the labia or clitoris, or both, which causes them to swell to two or three times their normal size. In fact, in the cases of Karajan and De Sinerty the operation was done for elephantiasis of the clitoris, and the tuberculous nature of the disease was revealed only by histological and bacteriological examination. A microscopic examination of these ulcers shows the base to be made up of a thin layer of tuberculous granulations and the raised edges of solid tuberculous tissue containing more or less typical miliary tubercles.

In the serpiginous course of such a tuberculous lesion the older parts of the ulcer may show the entire absence of tubercle bacilli, as is shown by the interesting case of Rieck. The involvement of the urethra is progressive, its inner surface loses its real mucous membrane character, is more or less exposed, and may be converted into scar tissue. The meatus appears to be torn laterally, as Emmet has pictured it for the cervix. The process continues until the urethra is almost entirely destroyed and is represented by a funnel-shaped ulcer.

The course of the ulcerative process is very slow, however, and the inguinal glands remain free for a remarkably long time. Cicatrization is sometimes associated with the ulceration, as an evidence of a tendency to spontaneous healing, and may lead to great deformity.

A conspicuous feature of this local infection with ulceration is the formation of fistulæ, especially in rodent ulcer of the vulva. A tendency to a deep penetration of the tissues may be present from the start. They first form underneath the mucous membrane, but very soon penetrate deeply, and may communicate with the rectum high up at the upper end of the perineal triangle. Three or four sinus openings on the vulva may coalesce below the surface and open into the rectum as a single channel.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE VAGINA

Tuberculosis infection of the vagina, as a distinct condition, is rare. Friedlander has, however, reported a case in which a vaginal ulcer, demonstrated to be tuberculous, was the only tuberculous lesion in the entire body.

As a rule, tuberculosis of the vagina occurs secondarily to a similar infection of the vulva or urethra, or both.

The vagina may be infected secondarily to and apparently as the result of tuberculosis of the peritoneum or tube without involvement of the intervening organs (Oppenheim), and it was Reynaud who first explained the usual seat of the first vaginal lesion in the posterior fornix, by the observation that it was here that virus-laden secretions from above first came in contact with the vagina. The infection may also be introduced from without by coitus with men suffering from a tuberculous disease of the sexual organs, by the hands or instruments of the physician or midwife, from the urine, from filthy bed linen or wearing apparel, from the air, from the blood (Davidsohn), and by infection in continuity of tissue from neighboring organs, as in vesical or rectal fistulæ.

The infrequency of the disease in both the vagina and vulva, as compared with that of the higher organs, is probably to be explained by the natural resistance of squamous epithelium to bacterial invasion, and it is only after injury, abrasion, or the action of irritating secretions that the tubercle bacillus can gain entrance to the tissues.

The disease occurs with greatest frequency during the period of sexual activity (twenty to forty), yet seven and seventy-nine represent the two extremes of age in the collected cases.

Sometimes, as in two reported cases, the entire lesion consisted in an eruption of perfectly typical, fresh miliary tubercles over the entire vaginal wall. These tubercles are of millet seed size, and are made up microscopically of giant, epithelioid, and small round cells, which were supported by a delicate reticulum and showed areas of caseation. Tubercle bacilli are present. Favored by moisture and warmth, these miliary tubercles soon break down to form minute ulcers, or by their confluence will form larger sharply defined but irregular ulcers.

Such ulcers are characterized by perpendicular edges, a depressed grayish or yellowish-gray base, studded by tubercles and covered by caseous material, a size varying with the extent of the confluence, and a decided tendency to the serpiginous type. Such an ulcer is usually surrounded by an area of hyperemia, which is more or less filled with small, yellow, opaque, grain-like, miliary tubercles. The usual seat of ulceration, as has already been stated, is in the posterior fornix. When the infection is from without, however, the lower portion of the vagina will be first involved.

Tuberculous fistulæ are found in the later stages of the disease and are formed, as a rule, by an ulceration into the connective tissue, thence into urethra, rectum, bladder, or the skin surface of the perineum. On the other hand, fistulæ may be the result of perforating rectal or vesica [illegible] ulcers, and cases have been reported in which the fistula has its origi[illegible] in a broken down tuberculous Fallopian tube. These fistulæ are peculiar only in the fact that they are lined by the tuberculous membran[illegible]

PATHOLOGY OF TUBERCULOUS INFECTION OF THE UTERUS

Tuberculous infection of the uterus usually manifests itself in [illegible] the cervix, (b) the body of the uterus, and occasionally in (c) [illegible] the cervix and the body. A lesion beginning in one portion [illegible] passes beyond the anatomic dividing line (the internal os), an[illegible] pathologic changes which the tubercle bacillus causes are mar[illegible] different in the two regions.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE CERVIX

According to H. J. Whitacre, who made an extensiv[illegible] this question at the instance of the author, tuberculosis [illegible] is a condition which was declared by Rokitansky and [illegible] exist, and Spaeth in 1885 collected only six cases. S[illegible] ever, when Hegar demonstrated the clinical importan[illegible] berculosis, and since the introduction of routine m[illegible] and microscopic examination of cervical secretions [illegible] number of cases has multiplied rapidly, and tuber[illegible] is looked upon at the present day as a condition [illegible] the diagnosis of every lesion of the cervix.

The disease is usually second[illegible] tubercu[illegible] tubes, peritoneum, or vagina, yet [illegible] the [illegible] in the genital tract of phthisic [illegible] lander and Péan, it may repre[illegible] entire body. The relative inf[illegible] explained by the resisting p[illegible] portio vaginalis, and by a [illegible] canal, as has been demons[illegible] posing causes of infectio[illegible] discharges, lacerations, and erosions. It is difficult to explain the immunity of the uterus to a simultaneous infection, when the lesion is clearly secondary to a tuberculous infection of the Fallopian tubes or peritoneum. The monthly exfoliation of the corporeal endometrium probably plays a definite rôle (Sippel, Vassmer, Schöttlander). The infection of the cervix may take place by an extension from either the higher or the lower parts of the genital tract, by way of the blood stream or by direct inoculation from without.

The *miliary form* may be looked upon as the first stage of the diffuse tuberculous form, and may be described as a catarrhal inflammation of the cervical mucosa with the presence beneath the epithelial surface of miliary tubercles too small to be seen by the naked eye. The folds of the arbor vitæ become enlarged and produce pronounced villosities and secondary villosities with deep fissures between the folds. The epithelium over the surface remains intact, and small masses of round cells containing giant cells and a few tubercle bacilli are found in the stroma, which is at the same time the seat of a small round-celled infiltration. The glands are not at first involved. Below the mucous membrane miliary tubercles of larger size are found, and, even when we have to do with a tuberculous eruption which is slight, superficial, of recent date, and has caused no destruction of tissue, we must expect to find the muscular layers infiltrated by miliary tubercles which are formed along the course of the blood vessels. The condition may continue as a miliary tuberculosis, the most frequent form of cervical involvement, or the miliary tubercles may increase in size and number, become caseous, and run together to form the lesions of the second or diffuse form, where the mucous membrane is converted in part or in its entirety into an ulcerating caseous mass. When this occurs the glandular elements show every degree of destruction, the tissues show infiltration and thickening, and the cervical canal becomes a worm-eaten cavity containing caseous material (Matthews). The interior of such a cavity is lined by tuberculous granulations, which bleed easily and exude a heavy discharge, and the muscular tissues are infiltrated by discrete miliary tubercles. There is a marked tendency to fibrous infiltration, as was first pointed out by Williams.

The *papillary form* of cervical tuberculosis, as reported by Fränkel, Cornil, Péan, Franqué, and Vitrae, possesses a special interest from a clinical point of view, because of its naked-eye resemblance to carcinoma. It is characterized by a papillary growth of the arbor vitæ, which pushes back the pavement epithelium of the portio vaginalis and attains a considerable tumor formation. These tumors show slight tendency to break down and present the typical microscopic picture of tuberculosis. Their naked-eye appearance is not typically tuberculous.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE CAVITY AND BODY OF THE UTERUS

(*Corporeal Tuberculosis, Tuberculous Endometritis, Tuberculous Parametritis*)

Tuberculous infection of the body of the uterus, as explained by Whitacre, must be described as a lesion essentially independent of similar infection of the cervix. It is recognized by Maylard and other writers as altogether the most frequent and consequently the most important of the tuberculous infections of the female pelvic organs. It is said to occur in two-thirds of all cases of general tuberculosis; it occurs in connection with tuberculous disease of other genital organs, or the process may be primary in the endometrium. From the point of frequency the corporeal endometrium stands second among the female genital organs. This type, like all other forms of genital tuberculosis, has been studied more especially since Hegar called attention to its clinical importance, yet the frequency of the uterine disease has only been fully appreciated in the last few years, since routine histological and bacteriological examinations of all curettings have been made.

The infection may reach the uterus from above or from below. It may travel either by direct invasion of contiguous structures or through lymph channels, which are favorably arranged for the purpose. Its frequent association with tubal disease would indicate that a descending infection is the more common. Coitus certainly must be considered to be a source of infection when we remember the frequency of tuberculous disease of the male genitourinary tract, and particularly since the demonstration by Jani of tubercle bacilli in the semen and in the apparently healthy prostate and testicles of men suffering from phthisis. Numerous cases are reported where women suffering from genital tuberculosis have lived with tuberculous men. Jani has injected the apparently healthy testicle of tuberculous men into the peritoneal cavity of guinea pigs, and has produced a typical tuberculous peritonitis. It has been asserted that a tuberculous process arising from coitus is primarily a tubal tuberculosis, and that the uterus is secondarily infected. Instruments or the examining finger may carry infection, or the transfer may be by direct self-infection from a tuberculosis of the vulva, vagina, or from tuberculous stools. The relative immunity of the vulva, vagina, and cervix has been explained by their protecting flat epithelium, and in the uterine cavity we find again a decided protection in the monthly exfoliation of the mucous membrane. The puerperal state certainly predisposes to infection, as is shown by the authentic cases of Frorieps, Rokitansky, Heimbs, Brues, Geil, Schüll, and by the demonstration of tubercle bacilli by Hünermann in a septic thrombus after abortion. Schmorl, Rockel, Thorn, and others have reported cases of pregnancy that began and went to full terms in spite of a caseous endometritis.

The age of the patient seems to make little difference, yet Kaufmann holds that the female organs show a predisposition to tuberculosis after forty years of age, the very young being relatively exempt.

Tuberculous infection of the body of the uterus manifests itself in the form of (a) miliary tubercles without ulcerating, (b) a diffuse, sometimes caseous, endometritis, and (c) a fibroid type, both of the last two being essentially chronic in their course.

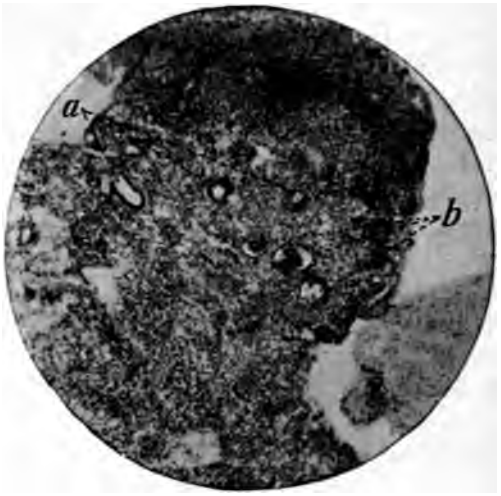


Fig. 275.—Tuberculous Infection of the Uterus, Showing a Section of the Corporeal Endometrium in Which the Epithelioid Nodules are Surrounded by Small Round Cells with Giant Cells (b) in Their Center with Only Remnants of the Glands (a) Remaining (Whitacre).

(a) The miliary form begins by a deposit of minute tubercles in the interglandular substance of the mucous membrane of the fundus of the uterus near the entrance of the Fallopian tubes (Kelly, Cullen, Williams, Walther, Vassmer). The epithelial surface remains intact, as does also the glandular element, and the presence of a few tubercles made up of epithelial cells alone or of single giant cells containing tubercle bacilli may be the only evidence of tuberculosis in the entire mucosa. Later the epithelioid nodules are surrounded by small round cells, and still later giant cells appear in their center and only remnants of the glands remain (Fig. 275). In more advanced cases the miliary tubercles are more numerous, and the glandular tissue is so much affected that Cornil and Franqué have characterized it as a chronic tuberculous endometritis, with the principal participation of the glands, which become enlarged and show indistinct markings. Coincident with the glandular hypertrophy there is a strong infiltration of the interglandular tissue (Abel). Polyp formation, however, which is so frearises primarily in the tube or is the result of an infection from a primary focus in the lung, intestine, or peritoneum. The latter is by far the most frequent mode of infection.

The process must also be recognized as either an *ascending* or a *descending* form of infection, of which the latter is always a secondary tubal tuberculosis, while the former furnishes all the primary cases and may be a secondary tuberculosis. In the ascending type of infection the tubercle bacillus must be mechanically deposited in the vagina or uterus by dirty fingers or instruments, from the clothes or the feces of the patient who suffers from tuberculous enteritis, by coitus, or from a tuberculous ulceration of the vulva or vagina. It is conceded that the primary form of infection may be the result of coitus with men suffering from a tuberculosis of one or more of their genital organs. This belief is supported by these facts: (a) that tuberculosis of the female genital organs occurs with greatest frequency between twenty and forty years of age; (b) the recognition of the tubercle bacilli in the semen of such men (Dewille); (c) the demonstration of tubercle bacilli in the apparently sound genital organs of phthisical men (Fernet, Jani); and, finally, (d) the demonstration by Schuchardt of tubercle bacilli in the urethral secretions of gonorrhea.

The method of transit as well as the highway of invasion in the ascending form have been matters of legitimate speculation. Just how, for example, the bacillus is transferred from the vagina to the tube without infection of intermediate organs is a point difficult of solution. The escape of the intermediate tissues (vagina, cervix, uterus) has been very justly compared to the immunity of the nose, throat, and larynx in lung tuberculosis, and is explained by their natural protective forces. The tube lacks protection and seems to offer a most suitable nidus for bacterial development. The spermatozoa, by reason of their peculiar motion upward, would seem to be the most natural carriers of adherent infectious material, and this method of transfer is accepted by Menge, Pozzi, Chiari, and Veit, but lacks definite proof. Hegar believes that the tubercle bacillus may enter by slight or extensive abrasions of the mucous membrane of the vulva, vagina, or uterus, travel in the regular course of the lymphatic stream, and find a lodgment in the outer end of the Fallopian tube or the ovary. This belief is supported (1) by the observations of Maier, who has shown that puerperal inflammation of the Fallopian tubes generally begins at the outer end; (2) by the fact that this channel of transfer has anatomical support; and (3) by the frequent occurrence of tuberculous salpingitis after childbirth and abortion. In this connection the researches of Delamere, Poirier, and Cunéo on the lymphatics of the uterus and appendages have had a clarifying effect. They have confirmed the researches of Mas-

This picture of tuberculosis is formed by the presence of typical grayish-yellow or transparent miliary nodules on the surface; the lumen is dilated and filled by caseous material, and adhesions bind the tube down in the pelvis. The abdominal end may be open, when the fimbriæ are swollen and pushed over the opening; or the ostium may be closed by a plug formed of pseudomembrane and tubercle tissue, when the tube may become dilated to almost any degree, and may assume most surprising shapes. Veit has seen a case in which the isthmus of the tube was so distended as to give the appearance of an extension outward of the uterine cornu. The tube contents, according to their constituents, may be fluid, milky, of the consistence of cream or cheese, or at times chalky. The usual type is a grayish-yellow cheesy mass. The mucous membrane also shows marked changes, and is covered by tubercles in every stage of metamorphosis. In prolonged cases it may be entirely replaced by a necrotic caseous mass. The wall of the tube is usually thickened.

The form of such tumors does not differ from that of tubes otherwise inflamed. Tumors of sausage, retort, and torpedo shape are the usual forms, while Hegar has placed special weight first on a *rosary-shaped swelling* and, secondly, on a swelling at the *isthmus of the tube* that gives the appearance of an extension outward of the horn of the uterus. A closure of the outer end may result in a dilatation of the tube and a collection of pus that may reach two quarts (Stemann). The tumor will be further modified by the development of peritoneal products and adhesions. The position of the tumor shows all the variations that we might expect in severe inflammatory change. Switalski reports a case in which a tubal tumor the thickness of a finger was found in front of the uterus, lying on top of and involving secondarily the bladder wall.

Acute tuberculous infection of the tubes is usually characterized by an involvement mainly of the ampulla and a rapid breaking down of the tuberculous mucous membrane, which becomes changed into a cheesy detritus. Through this process the muscle is destroyed in part or in its entirety, and the lumen is widened to a certain extent. Microscopically the mucous membrane shows a rich round-celled infiltration and numerous miliary tubercles, but very few giant cells, owing to the promptness with which a central necrosis occurs in the tubercles. As the process advances the mucous membrane becomes changed into a detritus containing many tubercle bacilli. The muscle layer shows distinct miliary tubercles or caseous areas between the fibers (Fig. 276).

Chronic tuberculous infection of the tubes results in the prompt relaxing of the abdominal end of the tube. This results in the development of a tuberculous pyosalpinx. In certain cases, however, the de-surrounded by an area of hyperemia, which is more or less filled with small, yellow, opaque, grain-like, miliary tubercles. The usual seat of ulceration, as has already been stated, is in the posterior fornix. When the infection is from without, however, the lower portion of the vagina will be first involved.

Tuberculous fistulæ are found in the later stages of the disease and are formed, as a rule, by an ulceration into the connective tissue, thence into urethra, rectum, bladder, or the skin surface of the perineum. On the other hand, fistulæ may be the result of perforating rectal or vesical ulcers, and cases have been reported in which the fistula has its origin in a broken down tuberculous Fallopian tube. These fistulæ are peculiar only in the fact that they are lined by the tuberculous membrane.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE UTERUS

Tuberculous infection of the uterus usually manifests itself in (a) the cervix, (b) the body of the uterus, and occasionally in (c) both the cervix and the body. A lesion beginning in one portion rarely passes beyond the anatomic dividing line (the internal os), and the pathologic changes which the tubercle bacillus causes are markedly different in the two regions.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE CERVIX UTERI

According to H. J. Whitacre, who made an extensive research on this question at the instance of the author, tuberculosis of the cervix is a condition which was declared by Rokitansky and Lebert not to exist, and Spaeth in 1885 collected only six cases. Since 1886, however, when Hegar demonstrated the clinical importance of genital tuberculosis, and since the introduction of routine methods of bacterial and microscopic examination of cervical secretions and curettings, the number of cases has multiplied rapidly, and tuberculosis of the cervix is looked upon at the present day as a condition that must enter into the diagnosis of every lesion of the cervix.

The disease is usually secondary to tuberculosis of the Fallopian tubes, peritoneum, or vagina, yet it may be the sole seat of tuberculosis in the genital tract of phthisical women, or, as in the cases of Friedlander and Péan, it may represent the only seat of tuberculosis in the entire body. The relative infrequency of cervical tuberculosis has been explained by the resisting power of the squamous epithelium on the portio vaginalis, and by a natural antibacterial action of the cervical canal, as has been demonstrated experimentally by Menges. Predisposing causes of infection are undoubtedly to be found in irritating discharges, lacerations, and erosions. It is difficult to explain the immunity of the uterus to a simultaneous infection, when the lesion is clearly secondary to a tuberculous infection of the Fallopian tubes or peritoneum. The monthly exfoliation of the corporeal endometrium probably plays a definite rôle (Sippel, Vassmer, Schöttlander). The infection of the cervix may take place by an extension from either the higher or the lower parts of the genital tract, by way of the blood stream or by direct inoculation from without.

The *miliary form* may be looked upon as the first stage of the diffuse tuberculous form, and may be described as a catarrhal inflammation of the cervical mucosa with the presence beneath the epithelial surface of miliary tubercles too small to be seen by the naked eye. The folds of the arbor vitæ become enlarged and produce pronounced villosities and secondary villosities with deep fissures between the folds. The epithelium over the surface remains intact, and small masses of round cells containing giant cells and a few tubercle bacilli are found in the stroma, which is at the same time the seat of a small round-celled infiltration. The glands are not at first involved. Below the mucous membrane miliary tubercles of larger size are found, and, even when we have to do with a tuberculous eruption which is slight, superficial, of recent date, and has caused no destruction of tissue, we must expect to find the muscular layers infiltrated by miliary tubercles which are formed along the course of the blood vessels. The condition may continue as a miliary tuberculosis, the most frequent form of cervical involvement, or the miliary tubercles may increase in size and number, become caseous, and run together to form the lesions of the second or diffuse form, where the mucous membrane is converted in part or in its entirety into an ulcerating caseous mass. When this occurs the glandular elements show every degree of destruction, the tissues show infiltration and thickening, and the cervical canal becomes a worm-eaten cavity containing caseous material (Matthews). The interior of such a cavity is lined by tuberculous granulations, which bleed easily and exude a heavy discharge, and the muscular tissues are infiltrated by discrete miliary tubercles. There is a marked tendency to fibrous infiltration, as was first pointed out by Williams.

The *papillary form* of cervical tuberculosis, as reported by Fränkel, Cornil, Péan, Franqué, and Vitrae, possesses a special interest from a clinical point of view, because of its naked-eye resemblance to carcinoma. It is characterized by a papillary growth of the arbor vitæ, which pushes back the pavement epithelium of the portio vaginalis and attains a considerable tumor formation. These tumors show slight tendency to break down and present the typical microscopic picture of tuberculosis. Their naked-eye appearance is not typically tuberculous.

the authentic cases of Frorieps, Rokitansky, Heimbs, Brues, Geil, Schüll, and by the demonstration of tubercle bacilli by Hünermann in a septic thrombus after abortion. Schmorl, Rockel, Thorn, and others have reported cases of pregnancy that began and went to full terms in spite of a caseous endometritis.

The age of the patient seems to make little difference, yet Kaufmann holds that the female organs show a predisposition to tuberculosis after forty years of age, the very young being relatively exempt.

Tuberculous infection of the body of the uterus manifests itself in the form of (a) miliary tubercles without ulcerating, (b) a diffuse, sometimes caseous, endometritis, and (c) a fibroid type, both of the last two being essentially chronic in their course.

(a) The miliary form begins by a deposit of minute tubercles in the interglandular substance of the mucous membrane of the fundus of the uterus near the entrance of the Fallopian tubes (Kelly, Cullen, Williams, Walther, Vassmer). The epithelial surface remains intact, as does also the glandular element, and the presence of a few tubercles made up of epithelial cells alone or of single giant cells containing tubercle bacilli may be the only evidence of tuberculosis in the entire mucosa. Later the epithelioid nodules are surrounded by small round cells, and still later giant cells appear in their center and only remnants of the glands remain (Fig. 275). In more advanced cases the miliary tubercles are more numerous, and the glandular tissue is so much affected that Cornil and Franqué have characterized it as a chronic tuberculous endometritis, with the principal participation of the glands, which become enlarged and show indistinct markings. Coincident with the glandular hypertrophy there is a strong infiltration of the interglandular tissue (Abel). Polyp formation, however, which is so fre-

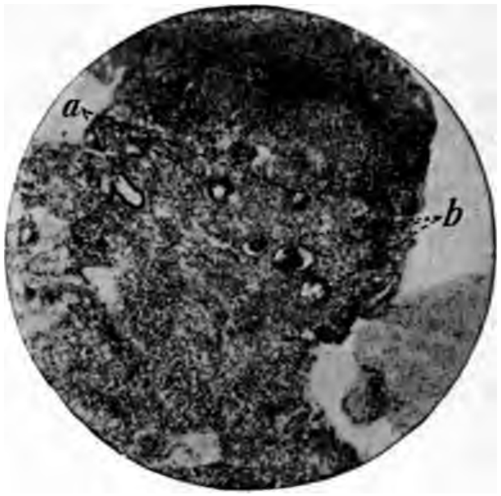


FIG. 275.—TUBERCULOUS INFECTION OF THE UTERUS, SHOWING A SECTION OF THE CORPOREAL ENDOMETRIUM IN WHICH THE EPITHELIOID NODULES ARE SURROUNDED BY SMALL ROUND CELLS WITH GIANT CELLS (b) IN THEIR CENTER WITH ONLY REMNANTS OF THE GLANDS (a) REMAINING (Whitacre).

quent in other types of endometritis, and which forms a distinct class in tuberculous cervicitis, does not occur, and nodules larger than a pea are never seen. Madiener and Zahn have reported cases in which large polypi were found to contain miliary tubercles and tubercle bacilli, but they are considered to be a secondary infection of a preëxisting polyp.

(b) The diffuse or caseous form, essentially chronic, may be said to occur as a succeeding stage of the miliary form just described. The miliary tubercles finally run together, caseate, and break down to form irregular undermined ulcers, which by their confluence convert the endometrium into a caseous mass, involving, first, the superficial layers, then the entire thickness of the mucous membrane. Below this is a zone of typical tuberculous tissue consisting of epithelioid cells, tubercles, giant cells, and a varying amount of gland remnants. It is important to remember that the caseous mass simply replaces the mucosa (Pozzi). The muscle tissue shows distinct miliary and submiliary tubercles which are formed along the course of the infiltrated blood vessels (Hofbauer). The muscle tissue is usually distinctly hypertrophied, and finally becomes extensively infiltrated and destroyed. A mixed infection by the pyogenic cocci, when associated with mechanical obstruction of the internal os, will lead to pyometra—a very common condition in cases in which the spontaneous drainage of the cavity of the uterus has been interfered with by ulceration at or near the cervico-corporeal juncture.

(c) The fibroid type, also essentially chronic, was first described by Williams as a miliary tuberculosis characterized by an excessive development of fibrous tissue within and around the miliary tubercles. Thus far it has been recognized on the autopsy table alone. From the descriptions given it would seem that, in certain instances at least, the so-called fibrosis develops in the course of repair following tissue destruction.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE FALLOPIAN TUBES

The *Fallopian tubes are more frequently* the seat of tuberculous *infection than any other of the genitourinary* organs of women. This fact, established by the *researches of* Hegar and Williams and confirmed by Whitacre, showed that *many* tubes, removed as simply adherent from other *forms of infection*, were really tuberculous.

The *process is characterized* (a) by formation of miliary tubercles in the *walls of the tube*, (b) by *tumor* formation, and (c) by a *progressive infection of the remainder of the* genital organs. The infection may be *primary or secondary*, according as the tuberculous process arises primarily in the tube or is the result of an infection from a primary focus in the lung, intestine, or peritoneum. The latter is by far the most frequent mode of infection.

The process must also be recognized as either an *ascending* or a *descending* form of infection, of which the latter is always a secondary tubal tuberculosis, while the former furnishes all the primary cases and may be a secondary tuberculosis. In the ascending type of infection the tubercle bacillus must be mechanically deposited in the vagina or uterus by dirty fingers or instruments, from the clothes or the feces of the patient who suffers from tuberculous enteritis, by coitus, or from a tuberculous ulceration of the vulva or vagina. It is conceded that the primary form of infection may be the result of coitus with men suffering from a tuberculosis of one or more of their genital organs. This belief is supported by these facts: (a) that tuberculosis of the female genital organs occurs with greatest frequency between twenty and forty years of age; (b) the recognition of the tubercle bacilli in the semen of such men (Dewille); (c) the demonstration of tubercle bacilli in the apparently sound genital organs of phthisical men (Fernet, Jani); and, finally, (d) the demonstration by Schuchardt of tubercle bacilli in the urethral secretions of gonorrhea.

The method of transit as well as the highway of invasion in the ascending form have been matters of legitimate speculation. Just how, for example, the bacillus is transferred from the vagina to the tube without infection of intermediate organs is a point difficult of solution. The escape of the intermediate tissues (vagina, cervix, uterus) has been very justly compared to the immunity of the nose, throat, and larynx in lung tuberculosis, and is explained by their natural protective forces. The tube lacks protection and seems to offer a most suitable nidus for bacterial development. The spermatozoa, by reason of their peculiar motion upward, would seem to be the most natural carriers of adherent infectious material, and this method of transfer is accepted by Menge, Pozzi, Chiari, and Veit, but lacks definite proof. Hegar believes that the tubercle bacillus may enter by slight or extensive abrasions of the mucous membrane of the vulva, vagina, or uterus, travel in the regular course of the lymphatic stream, and find a lodgment in the outer end of the Fallopian tube or the ovary. This belief is supported (1) by the observations of Maier, who has shown that puerperal inflammation of the Fallopian tubes generally begins at the outer end; (2) by the fact that this channel of transfer has anatomical support; and (3) by the frequent occurrence of tuberculous salpingitis after childbirth and abortion. In this connection the researches of Delamere, Poirier, and Cunéo on the lymphatics of the uterus and appendages have had a clarifying effect. They have confirmed the researches of Mascagni in demonstrating continuous lymphatic connection between the body of the uterus and the Fallopian tubes.

Descending infection, its methods and highways of transit are better understood since Pirmer has demonstrated that fine bodies (cinnabar or Chinese ink) injected into the peritoneal cavity will soon find their way into the tubal ostium through the tube and into the uterus. Added to this we have the demonstration that the tubercle bacillus and other bacteria may pass through the intestinal wall in the floor of a tuberculous ulcer and float free in the peritoneal cavity (Mosler, Jans). The explanation here would seem complete. The tube may also become diseased through direct extension in continuity of tissue from a neighboring tuberculous organ, usually from the peritoneum. W. Mayer has collected 194 cases of secondary tuberculosis of the female genital organs, in which number the peritoneum was diseased 110 times; indeed, a number of authors have considered this to be the almost exclusive method of tubal infection. A secondary disease of the Fallopian tube does not invariably result from a tuberculous peritonitis, however, as will be shown by the fact that Schramm found an idiopathic tuberculous peritonitis without disease of the tube 33 times in 3,356 autopsies. Tuberculous tumors of the rectum, sigmoid, or mesenteric glands may also communicate the infection directly to an adherent tube.

Secondary tuberculous infection of the uterus, i. e., involvement of the uterus secondarily to primary infection of some remote and noncontiguous organ or structure, at once suggests the blood current as the highway of transit (hematogenous infection). There is no reason why this method should not be given the importance as a causative factor in the genital tract that is attached to it in bone, joint, and brain tuberculosis. The point of entrance of the germs may show no tuberculous changes, and the only lesion in the entire body may be that in the tube, or the primary focus in the lung or in a bone, from which the embolus came, may be so small and difficult to find that a mistaken diagnosis of a primary disease may be made.

Tuberculous infection of the Fallopian tubes is generally bilateral, although present in a different degree on the two sides. The general appearance of the organs will vary greatly with the stage, character, and severity of the inflammatory process. The' type designated by Williams as "unsuspected tubal tuberculosis" will, of course, not be observed, and the more advanced cases will present every change from slight enlargement to the most extensive matting together of pelvic contents and the formation of abscesses. The tubes that we usually see have already undergone a more or less high degree of change, and their form does not vary, as a rule, in any way from that presented by ordinary pus tubes (see Gonococcus Infection of the Fallopian Tubes).

This picture of tuberculosis is formed by the presence of typical grayish-yellow or transparent miliary nodules on the surface; the lumen is dilated and filled by caseous material, and adhesions bind the tube down in the pelvis. The abdominal end may be open, when the fimbriæ are swollen and pushed over the opening; or the ostium may be closed by a plug formed of pseudomembrane and tubercle tissue, when the tube may become dilated to almost any degree, and may assume most surprising shapes. Veit has seen a case in which the isthmus of the tube was so distended as to give the appearance of an extension outward of the uterine cornu. The tube contents, according to their constituents, may be fluid, milky, of the consistence of cream or cheese, or at times chalky. The usual type is a grayish-yellow cheesy mass. The mucous membrane also shows marked changes, and is covered by tubercles in every stage of metamorphosis. In prolonged cases it may be entirely replaced by a necrotic caseous mass. The wall of the tube is usually thickened.

The form of such tumors does not differ from that of tubes otherwise inflamed. Tumors of sausage, retort, and torpedo shape are the usual forms, while Hegar has placed special weight first on a *rosary-shaped swelling* and, secondly, on a swelling at the *isthmus of the tube* that gives the appearance of an extension outward of the horn of the uterus. A closure of the outer end may result in a dilatation of the tube and a collection of pus that may reach two quarts (Stemann). The tumor will be further modified by the development of peritoneal products and adhesions. The position of the tumor shows all the variations that we might expect in severe inflammatory change. Switalski reports a case in which a tubal tumor the thickness of a finger was found in front of the uterus, lying on top of and involving secondarily the bladder wall.

Acute tuberculous infection of the tubes is usually characterized by an involvement mainly of the ampulla and a rapid breaking down of the tuberculous mucous membrane, which becomes changed into a cheesy detritus. Through this process the muscle is destroyed in part or in its entirety, and the lumen is widened to a certain extent. Microscopically the mucous membrane shows a rich round-celled infiltration and numerous miliary tubercles, but very few giant cells, owing to the promptness with which a central necrosis occurs in the tubercles. As the process advances the mucous membrane becomes changed into a detritus containing many tubercle bacilli. The muscle layer shows distinct miliary tubercles or caseous areas between the fibers (Fig. 276).

Chronic tuberculous infection of the tubes results in the prompt relaxing of the abdominal end of the tube. This results in the development of a tuberculous pyosalpinx. In certain cases, however, the de-

[illegible]

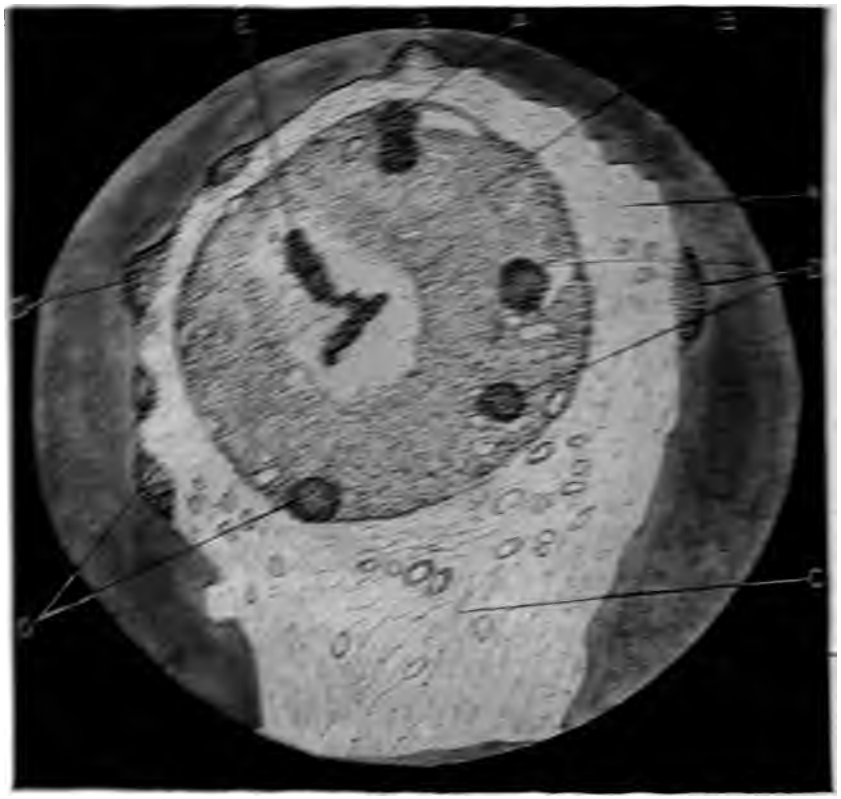


FIG. [illegible]. TUBERCULOUS INFECTION OF THE FALLOPIAN TUBE. A, tube wall thickened; B, mucous membrane of the tube in a condition of adenomatous hyperplasia; C, broad ligament, much thickened; D, miliary tubercles on the peritoneal surface and in the mucosa; E, the lumen of the tube surrounded by a zone of caseous degeneration. (Whitacre.)

[illegible] tubercles in the mucous membrane beneath the epithelial surface. These tubercles are discrete, typical in their structure, show very little tendency to caseate, and remain confined to the mucosa for a long time. This stage forms the type of "unsuspected tubal tuberculosis" described by Williams, and will be revealed only on microscopic examination. An increased number of tubercles, however, will result in an infiltration and swelling of the folds of the mucous membrane, and the dilated lumen will be filled by what seems to be a caseous tuberculous mass, but is found microscopically not to have broken down in any part (Martin). At other times the tubercle bacillus excites decided proliferation in the glandular elements to the degree of distinct adenomatous tumor formations. This has been observed with sufficient frequency to call for special mention (Wolff, Orthmann, Friedlander, Landau, Rheinstein, and others), and is considered to be a hyperplasia analogous to that of the epithelium in lupus. These growths may be confused with malignant tumors, and it is important to remember their tuberculous origin.

The tubercles of the chronic type have many giant cells and few tubercle bacilli. The muscularis does not become involved until very late in the disease, and its marked thickening must be looked upon as a hypertrophy of the muscle and connective tissue elements, and not as a tuberculous growth. Tubercles may be found in the muscularis in the late stages. The serosa may be thickly covered by hempseed-sized tubercles, and the tubal ostium is usually closed by adhesions. A true pyosalpingitis manifests itself in relatively few cases (Schröder, Winckel, Martin, Münster).

The closing of the tubal ostium and the fibrous thickenings found in the chronic forms seem to be a curative effort on the part of nature. Yet it must be remembered that the caseous contents may escape from the open end of a tube into the free abdominal cavity (Hegar), and, furthermore, that encapsulation does not always occur when this does take place (Knauer).

Spontaneous healing may also certainly take place by a calcification of the focus (Kiwisch, Rokitansky), while a tuberculous abscess may heal by rupturing into the rectum, the vermiform appendix, or the small intestine (Veit).

Gonococci have been found a number of times in tuberculous tubes, and it would seem probable that a preëxisting gonorrheal salpingitis would predispose the tube to a tuberculous infection. This mixed type of infection has sometimes resulted in confusion as to the determining etiological factor in the case.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE OVARY

Tuberculous infection of the ovaries is to-day known to be a disease of such frequent occurrence as to demand systematic consideration in any work on gynecology. Schöttlander has collected 153 cases of reported tuberculous oöphoritis, but accepts only 30 of these, in which a microscopic examination was reported. He admits that many of those in which the microscopic examination was not made were undoubtedly tuberculous, yet thinks they can not have a scientific value.

It is only since the advent of the means for exact research, and the cultivation of routine methods of examining all material obtained from the autopsy table or the operating room, that the frequency of this condition has been demonstrated. Such methods have made it clear that ovaries showing no macroscopical change may yet contain numerous miliary tubercles (Wolff, Schöttlander, Franqué).

The method and avenue of infection in these cases are not clearly established. Klebs believes that the tube is the usual source of infection, and that the infection is transmitted in continuity of tissue rather than by means of the blood. Others believe that the blood is the most probable carrier of the tubercle bacilli (Mosler, Guillemain), yet Jani and Westermeyer-Jäcksh have failed to find the tubercle bacillus in the apparently healthy ovaries of a series of phthisical patients, and the latter investigators obtained a positive result in only one case by the inoculation of the peritoneum of animals by such ovaries. Schöttlander believes that the peritoneum is the usual source of infection, yet accepts a tubal origin, and believes that the bacteria may often enter by an abrasion in the vagina or vulva, and ascend to the ovary by way of the lymphatics without a lesion at the point of inoculation. Franqué has directly traced such an infection from an abrasion in the vault of the vagina. A primary localization of the tubercle bacillus in the ovary is extremely rare. Jacobs has reported such a case of one-sided tuberculosis of the ovary, where the Fallopian tube showed only an interstitial inflammation and the lungs were certainly only involved after the operation.

The merely miliary form of tuberculous infection is rarely met with in the ovary. In the majority of cases caseous foci are the more characteristic changes. There is also usually present an inflammatory condition of a more specific character, which results particularly in an atrophying process in the follicle. The caseous masses vary in size from that of a millet seed to that of a marble, may run together to form apple-sized cavities in which almost all ovarian tissue is destroyed, or, as has occurred in certain reported cases, the ovarian nature of the huge abscess cavity may be difficult of demonstration. Besides these changes there exists a simultaneous adhesive tuberculous pelviperitonitis of varying degree. Heiberg has often found a formation of small caseous foci in the dilated follicle, closely resembling a degenerated rupture follicle, yet the process seems to localize by preference in the stroma. This fact has been demonstrated as the rule in the collected cases, and has been further demonstrated by the experiments of Acconi, in which the injection of a pure culture of tubercle bacilli into the ovary always resulted in an interstitial deposit of tubercles, but never so when into the follicle. Schöttlander has observed follicle tuberculosis, however, in rabbits.

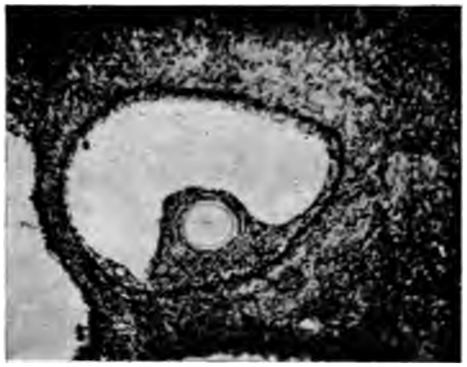


Fig. 277.—A Perfect Graafian Follicle in the Midst of Ovarian Stroma Which was in a State of Complete Tuberculous Infiltration (Whitacre).

It is a well-established fact that a miliary tuberculosis may exist in the apparently healthy ovary of tuberculous women (Schöttlander). H. J. Whitacre has observed a perfect Graafian follicle in the midst of ovarian stroma which was in a state of complete tuberculous infiltration (Fig. 277). The miliary tubercles are usually found in the superficial zone of the ovarian tissue, but sometimes find their way deeper, and always possess the usual characteristics of epithelioid, giant, and round-celled tubercles, but the tubercle bacilli are seldom found. Whitacre and Wolff have noted the appearance of considerable numbers of very large giant cells, completely alone and apart from other tuberculous products, in the stroma of the organ (Fig. 278). Schöttlander has called attention to the fact that the normal follicle, especially when cut just to one side of the ovum, will give rise to a collection of cells that very much resemble a miliary tubercle. The same confusion may also arise from an atrophied follicle. Frerichs has further stated that caseous foci in the ovary are not necessarily of tuberculous origin. It becomes apparent that this con-

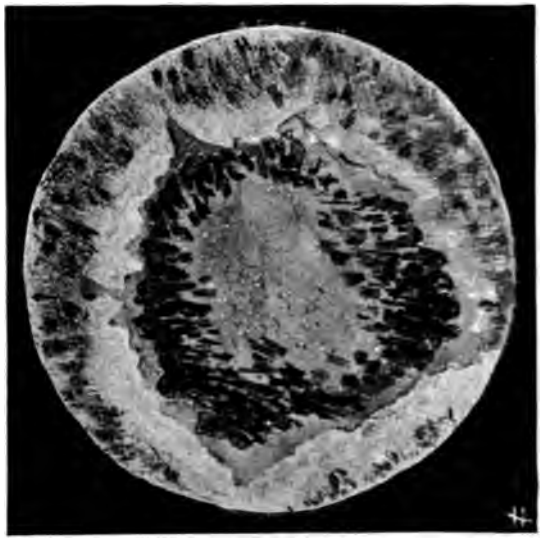


Fig. 278.—Large Giant Cells Noted in Tuberculous Ovary (Whitacre).

fusing feature in the usual histological picture of tuberculosis, when associated with the extreme difficulty encountered in demonstrating the tubercle bacillus, will render even a microscopic diagnosis difficult.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE PELVIC PERITONEUM

Tuberculous infection of the pelvic peritoneum is of frequent occurrence. It may be either (a) primary and the only manifestation of tuberculous infection in the system, or (b) it may occur secondarily to similar infection of the Fallopian tubes, ovaries, uterus, or other pelvic organs or structures, or it may be secondary to infection of some other part of the peritoneum. The process, whether primary or secondary, is characterized by the development of minute miliary tubercles over limited or extensive areas of the peritoneum, by ascites, by tumor formation, and by the development of caseous abscesses.

The method of invasion is at times difficult to determine, and certainly varies in different cases. The infection may take place from the blood in a very few cases. An infection through the female genital tract has been found by Williams to occur in from 40 to 50 per cent. of the cases, a fact which likewise has support in the greater frequency of tuberculous peritonitis in women than in men (Sippel). The female genital organs seem to afford an easy portal of entrance. Abbe has demonstrated that 66 per cent. of the cases are infected from tuberculous thoracic lymph nodes, and 16 per cent. through the mesenteric lymph nodes. The alimentary canal certainly may be the source of infection, since it has been well demonstrated that the tuberculous sputum or fragments of tuberculous lung (as used in animal experimentation) may cause an intestinal or a peritoneal tuberculosis (Klebs, Mosler, Jans).

A previously depressed state of health does not seem to be a predisposing factor, since the majority of these cases look well nourished in the early stages of the disease and have previously been in good health. Pregnancy shows a definite causal relationship which has not been adequately noted (Kelly).

The age of the patient likewise seems to be a predisposing factor, since the collected cases of Osler show that the greater number occur between the ages of twenty and thirty, and that the two extremes of age are relatively immune.

In regard to race, it has been shown that relatively the negro is more frequently affected than the white. Hereditary transmission of the disease has been observed to be an important etiological factor. Bumm has observed such transmission in 55 per cent. of his cases, Brehmer in 40 per cent., Desplans in 71 per cent., and Fuller in 60 per cent. A peculiar feature of the disease is the uncommon occurrence of grave tuberculous lesions in other parts of the body. Schröder states that it is a local phenomenon in 70.8 per cent. of cases. The presence of a tuberculous peritonitis would seem to afford an immunity to tuberculosis elsewhere (Kelly).

Pelvic tuberculous peritonitis is generally associated with tubal tuberculosis, and in this type of the disease is generally represented by cystic formation and extensive binding down of all pelvic structures into one hard mass. The cyst may extend well above the pubes, and the entire pelvis is lined and roofed by a thick, friable, grayish, tuberculous membrane, which is likewise adherent to the intestine above. The pelvic peritoneum is certainly the most frequent seat of tuberculous peritonitis, and this fact has been explained by Weigert, who has demonstrated that the tubercle bacilli always fall to the bottom of the peritoneal cavity.

The miliary form may appear and exist for a long time without giving the slightest symptoms. On opening the abdomen for other reasons the peritoneum of the pelvis or the entire peritoneal cavity is found to be peppered with minute miliary tubercles. The other appearances will vary greatly with the acuteness of the attack, the formation of adhesions, etc. In an acute miliary tuberculosis the peritoneum is noticeably congested and thickened, has lost its normal luster, and shows fresh lymph on the inflamed surfaces. The fluid in the peritoneal cavity is yellow or bloody, and may be encysted by adhesions, or free in the general cavity. The adhesions of the intestines to each other or of the omentum are not usually extensive, because of the tendency to effusion, and they are usually frail and bleed easily.

The caseous variety is characterized by a much more profound anatomical disturbance, by tumor formation, caseous abscesses, and severe interference with the functions of the intestine. In the most severe cases the peritoneum throughout is the seat of a caseous tuberculosis, all structures are agglutinated by the tuberculous pseudomembrane, and the entire mass of intestine may form a firm tumor which is retracted against the spinal column. A variable number of encysted accumulations of yellowish caseous or purulent fluid may be included in the tumor mass.

It is the rule, however, to find the disease more localized in the region of the pelvis, the cecum, the omentum, or the liver. Under these conditions the intestines adhere lightly or firmly together and may wall off the exudates in a more or less distinct sac, which represents the entire lesion, or a general ascites may coexist. Such a sac may be mistaken for a cyst. This error may be avoided, according to Whitacre, by observing (1) the fine white lines which mark the point of agglutination of the intestine by lymph and run parallel to it, and (2) a faint vermicular motion after a sharp blow with the finger. If such collections become purulent they may lead to ulceration and intervisceral or external fistulæ, or they may burrow extensively.

When the disease is localized in the omentum this organ becomes greatly thickened, but at the same time puckered and rolled up to form a firm, elongated tumor lying transversely across the upper part of the abdomen. This tumor may subsequently caseate and ulcerate either externally or into the intestine, but such a termination is extremely rare.

The fibroid type of tuberculous peritonitis is in reality a terminal stage of the preceding varieties, more especially the first. The miliary tubercles are found in a quiescent stage, with few cellular elements and very few bacilli, while old adhesions and tuberculous masses have almost entirely lost their tuberculous nature, and have been converted into firm fibrous tissue.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE BLADDER

Infection of the bladder by the *Bacillus tuberculosis* is probably never primary. On the contrary, the record would seem to indicate that it is always secondary to infections of the ovaries, Fallopian tubes, uterus, or bladder, mentioned inversely in the order of their frequency as etiological factors. Previous infection of the pelvic peritoneum seems frequently to be an antecedent condition.

The predisposing causes of tuberculous infection of the bladder may be roughly grouped as all conditions or influences that tend to break down the epithelial barrier and lessen the local resistance of the deeper tissues. I mention the importance of breaking down the epithelial barrier to infection as first in importance, because the records show that the majority of all cases of tuberculous infection result from the admission of the microorganisms through some atrium to the epithelium of the bladder. On the other hand, this infection is more liable to become effective relatively to the lowered resistance of the deeper tissues of the bladder wall. This is a factor of extreme importance when it is remembered that the infection may also reach the bladder through either the blood or the lymph channels.

This lowered resistance of both the epithelium and the deep structures of the bladder wall may result from previous infections of some other character, notably that by the gonococcus. In 71 out of 135 cases quoted by Guiteras there had been antecedent gonorrhea. Staphylococcus or streptococcus or other infection of the bladder tends in the same direction. Any condition, such as stricture or cystocele, that will favor the long retention of "residual" urine will favor the infection under consideration. Certain displacements of the uterus by inducing persistent mechanical irritation of the bladder and adhesions of the bladder favor the extension of the infection to that viscus.

The avenues by which the infection may reach the bladder are various. As already intimated, these avenues may be and generally are direct by way of the mucous tract. On the other hand, it is a matter of conclusive demonstration that the transit may be either hematogenous or lymphogenous. This condition is a pure infection only in its early stages. Shortly after the initial pathologic processes have been inaugurated the infection speedily passes into the mixed variety. This is especially true when the process reaches the stage of tissue disintegration, characterized by limited areas of ulceration.

The process generally manifests itself in the form of miliary tubercles located on the trigone near the orifice of one or the other ureter, rarely near both of them. This circumstance is significant of descent of the infection with the urine from an infected kidney. Later certain of these tubercles break down and form small ulcers around and near the circumference of which newer miliary tubercles make their appearance. At first these ulcerations are mere superficial erosions; later they are deeper, with better defined edges; still later they are still deeper, with infiltrated edges. While this process is generally inaugurated on the trigone, near the ureters, and even the sphincter, it may spread until it involves practically the whole interior surface of the bladder. Before this stage is reached, however, ecchymoses, minute or extensive, are observable. The pathologic process may penetrate deeply into the wall of the bladder. In certain instances this process is so deep that it induces a pericystitis with resulting painful adhesions. Cases have been reported in which the ulceration has resulted in perforation and the formation of fistulæ. Secondary infections may give to the process the characteristics of a more diffuse inflammation.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE KIDNEY

Tuberculosis of the kidney may exist as a primary affection, or it may be secondary to tuberculosis of other portions of the urinary tract or of contiguous structures. In the primary variety it is well understood that an infection atrium must have existed at some previous time through which the tubercle bacillus gained entrance to the body, and in many of these cases a latent tuberculous focus is found in the shape of an old tuberculous bronchial or mesenteric lymph gland. The bacilli are carried to the kidneys by the blood, and the process is, therefore, a pure hematogenous infection.

Women are more commonly affected than men, in the proportion of 29 women to 14 men (Tuffier); 148 women to 55 men (Albarran); and 73 women to 59 men (Bangs); a total of 378 cases, with 250 women, or 66 per cent. Almost any age may be affected, but 75 per cent. of the cases occur between the ages of twenty and forty years. The kidney is primarily affected in a majority of the cases, and usually at first but one organ is involved. Later the opposite organ may become affected.

Tuberculosis of the kidney secondary to involvement of the lower urinary tract is not so common in women as in men, in whom we may have a primary affection of the prostate, seminal vesicles, epididymis, etc. A tuberculous abscess originating in the vertebræ (Pott's disease) or from the bowel may extend to and involve the kidney secondarily.

The most common form observed is the large tuberculous nodule. Such a nodule is made up of a conglomerate mass of histologic tubercles, forming a grayish or yellowish mass, varying from 0.5 centimeter to 2 or 3 centimeters in diameter. Often there is but a single nodule, when it commonly occupies one or the other pole, but they may be multiple and disseminated throughout the kidney. The nodules undergo the usual changes so characteristic of tuberculous tissue, namely, caseation, and softening, or liquefaction. In this manner tuberculous abscesses are produced which may rupture into the pelvis or on the surface of the kidney into the perinephric tissue. The walls of such abscesses become lined with the usual tuberculous granulations which show occasional giant cells, and the surrounding kidney tissue shows the ordinary inflammatory changes. In tuberculous pyelitis small tubercles may be found disseminated more or less thickly in the mucosa. As these soften and break down small ulcers are formed. A single small tuberculous ulcer on one of the pyramids may give rise to pronounced hematuria, whch may persist for a long time without any other symptoms being present. The ureter may become involved, with the production of caseous nodules or masses, which may interfere with the escape of the urine and thus lead to the development of a tuberculous nephropyosis. A mixed infection in these cases is very common, the ordinary pyogenic organisms being the ones most frequently found. In almost all cases of tuberculosis of the kidney that have existed for any length of time marked changes occur in the perirenal tissues. Some of the fat becomes absorbed, while the connective tissue is greatly increased in amount. The entire fatty capsule thus becomes converted into a dense, hard mass, surrounding the kidney, and so intimately attached to the adjoining structures, particularly the colon and great vessels, that it is often impossible to detach it from them without a great danger of injury. This perinephritis fibrosa may form a tumor of considerable size, easily palpable through the abdominal wall. The tuberculous kidney occupies the interior of this dense capsule, and, while it is at times difficult or impossible to remove the capsule itself, the kidney is fortunately usually easily enucleable from its center. Provided all the tuberculous tissue is removed with the kidney, this dense perinephric mass may entirely disappear by absorption. When numerous abscesses develop, rupturing into the pelvis or into each other, the entire kidney substance may practically be destroyed, and nothing remain but abscess cavities whose walls are lined with tuberculous granulations. The lymph glands about the hilum of the kidney may become tuberculous, forming distinct separate nodules.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE RECTUM

The rectum, like other organs of the body, is occasionally the seat of tuberculosis; here, however, suffering is greater and healing more difficult to obtain because of the function of this organ. It is interesting to note the proportion of persons suffering from phthisis who are subjects of anal fistula, and the number of the latter who are phthisical. Probably "from 4 to 6 per cent. of all phthisical patients have fistula, while a much larger percentage of those afflicted with fistula have phthisis—12 to 15 per cent." Koch holds that tuberculosis of the intestine may be primary or secondary to pulmonary involvement. The bacilli may be introduced in food, especially milk, or through the swallowing of sputum coming from a tuberculous lung. In perfect health tubercle bacilli are destroyed by the gastric juice, but in cases of phthisis, where there are a lowered vitality and a weakened gastric fluid, it is believed that they pass through the stomach into the intestine without losing their activity.

Tuberculosis manifests itself in and near the rectum in three different forms, viz.: ulceration, stricture, and fistula.

From a clinical standpoint there are two kinds of tuberculous ulceration about the rectum, neither of which is of common occurrence, but both are difficult to cure. One is a real tuberculosis and can be demonstrated by the presence of the little tubercles and the bacilli. The second is a simple ulceration, from whatever cause, which is persistent owing to the debilitated condition of the patient caused by tuberculosis in the lung.

In many cases of tuberculosis of the rectum the disease is not confined to this organ, but distributes itself along the entire intestinal tract, and the breaking down of the deposit in one locality is followed shortly by a similar process in other parts, until the field of ulceration covers a considerable portion of the gut. In such cases the prognosis is bad; on the other hand, when the disease is located in the anal region we stand a fair chance of effecting a radical cure if we resort to heroic measures.

Tuberculous stricture is a rare disease in the rectum, because the tendency of ulceration is to extend rather than to heal and form contractile tissue. Gant has observed in young women 2 cases of tight stricture, undoubtedly of tuberculous origin. There are also two kinds of tuberculous fistulæ, the one the result of tuberculous infection, and the other due to ordinary causes, but made more difficult to combat because of the run down condition of the patient occasioned by tuberculosis in other organs.

PATHOLOGY OF TUBERCULOUS INFECTION OF THE BREAST

(*Tubercular Mastitis*)

Tuberculous infection of the breast is due to the *B. tuberculosis* of Koch in the subepithelial structure of the gland. It is essentially a condition of early middle life, the majority of cases occurring between twenty-five and thirty-five. It may, and most frequently does, occur independently of lactation; it may, and generally does, involve but one breast, and it occurs independently of systemic tuberculosis, which, however, may develop from tuberculosis of the breast. There is no evidence that the disease is hereditary.

SYMPTOMS AND DIAGNOSIS OF TUBERCULOUS INFECTION

SYMPTOMS AND DIAGNOSIS OF TUBERCULOUS INFECTION OF THE VULVA

As the first local manifestation of this infection is generally at the margin of the urethral orifice, the first symptom complained of is pain at that point in urination. At other times an ulcer giving no symptoms is discovered by the patient, or the nympha of one side, or the clitoris, is found to be increasing in size. A physical examination will reveal the presence of one or more ulcers, possessing the above-named characteristics. The course of such an ulcerative process is extremely slow, and may continue for many years as a local phenomenon without affecting the general health of the patient. The dribbling of urine and rectal irritation will, of course, be present in the advanced cases as most distressing symptoms. Death will eventually result from involvement of the internal organs.

A secondary tuberculosis of the vulva takes a much more rapid and malignant course; furthermore, the vulvar disease often possesses little significance in comparison with the primary lesion in the lung or other organs.

Askanazy has explained certain of these difficulties by the demonstration that we may meet with tumors not differing in their microscopical anatomy from typical tuberculosis, but characterized clinically by an absence of all tendency to caseation, abnormally large size of tumor formation, firm consistence, and, lastly, by a tendency to fibrous metamorphosis which may eventually lead to a complete obliteration of all specific tuberculous attributes.

The association of ulceration with elephantiasic thickening of the labia, the slow development, the chronicity of the ulceration, and, most important, the demonstration of tubercle bacilli in the secretions will serve to distinguish it from carcinoma. Simple elephantiasis is not associated with ulceration. Chancroid will usually be diagnosed by its history and clinical characteristics, by the absence of elephantiasis, by its multiple character, by its short duration, and by the absence of extensive and deep destruction of tissue.

SYMPTOMS AND DIAGNOSIS OF TUBERCULOSIS OF THE CERVIX UTERI

The symptoms of local infection of the cervix uteri may be masked by the symptoms of a primary more general infection. A primary cervical lesion gives no pain, and there is usually present a mucopurulent leukorrhea which may be occasionally tinged with blood. A physical examination of the cervix will reveal one of the conditions previously described.

A tuberculous lesion of the cervix may be readily mistaken for a carcinomatous ulcer. Many cases of tuberculous cervicitis have been operated on for carcinoma, and their true nature only revealed on microscopic examination (Cornil, Fränkel, Kaufmann, Godlio, Vitrac, Emanual); and it is probable that many such mistakes pass unrecognized when the material is not submitted to microscopic examination.

Epithelioma of the cervix is another condition easily confused with tuberculous lesion. The following table has been arranged for me by H. J. Whitacre as a convenient aid in distinguishing between the two conditions:

	TUBERCULOSIS	EPITHELIOMA
Size	Small.	No regularity.
Aspect	*Papillary* form: A muriform mass with small vegetations in the vicinity. *Ulcerative* form: Surface covered by caseous material and mucus. Border a seed bed of granulations.	Usually fungous. The cavity form lacks granulations in the edges. Never solely interstitial.
Color	*Papillary:* Rose red, deeper color than surrounding. *Ulcerative:* Bottom yellow or red.	Grayish.
Touch	*Papillary:* Surface knobbed, smooth, polished, elastic, no induration, limits not clear. *Ulcerative:* Depression without diffuse induration. Border granular.	Surface roughened, consistence very hard. If large and fungous, the base is very hard.
Spontaneous pain	Little or none	Characteristic.
Sensitiveness	Present	Absent.
Bleeding	May be slight in both papillary and ulcerative form.	Frequent and abundant.
Discharge	*Papillary:* Mucous. *Ulcerative:* Often purulent.	Fetid and abundant.
Progress	*Papillary:* Extremely slow. *Ulcerative:* Slow, yet may produce extensive ulceration and fistulæ.	Progressive and accompanied by constitutional symptoms.
Pathologic histology	Both show typical miliary tubercles and tubercle tissue.	Typical epithelioma with pearls and columns of cells.
Bacteria	Tubercle bacilli found in smear preparations, or by inoculating guinea pig.	None.

SYMPTOMS AND DIAGNOSIS OF TUBERCULOUS INFECTION OF THE VAGINA

The symptoms of tuberculous vaginitis are, as a rule, masked by those of the tuberculous disease existing in other parts of the body. A leukorrhea associated with painful coitus or pain in using the douche tube will usually be the first symptom that brings the patient to the physician for examination, or the symptoms of a vesicorectovaginal or urethrovaginal fistula may be the first that are referred to the vagina. A physical examination will reveal one or many sensitive ulcers possessing the above-named characteristics.

The *diagnosis* of the miliary form from granular vaginitis should not present great difficulties, when we remember the frequency of the latter as compared to the condition under discussion, also the usual association of the latter with pregnancy and gonorrhea. Furthermore, the character of the ulceration, and the fact that a tuberculous lesion of the vagina is almost invariably associated with a similar lesion elsewhere in the body, will prevent confusion. A chancre can be easily distinguished from a tuberculous ulcer by its history and clinical course;

the papular or ulcerative syphilids by the history, the total lack of pain, and mainly by their disappearance under antisyphilitic treatment. The reports of many of the recorded cases state that the patient was first subjected to antisyphilitic treatment, leading to the impression that this confusion often arises.

Finally, the secretion of every persistent ulceration of the vagina or vulva should be subjected to bacterial examination in smear or culture preparations, or inoculated into the peritoneal cavity of guinea pigs. The number of bacilli is often too few for easy demonstration by ordinary staining methods, yet it will cause a tuberculous peritonitis in the guinea pig in from three to four weeks when present in very small numbers. A microscopic examination of a snipping from the edge of the ulcer may be necessary to distinguish the condition from carcinoma.

Of course, the positive diagnosis of tuberculous infection of the cervix is made by demonstrating the presence of the *B. tuberculosis* in the discharges or scrapings from the lesion.

SYMPTOMS AND DIAGNOSIS OF TUBERCULOUS INFECTION OF THE BODY OF THE UTERUS

Primary tuberculous infection of the body of the uterus may be practically symptomless in its early stages. At no time can the symptoms be called characteristic, as they are practically those of an ordinary endometritis with thickening of the uterine wall. Pain, temperature, and a general tuberculous appearance are absent. There may be a non-characteristic, mucopurulent, even caseous discharge, but Vassmer has found no discharge in a series of six cases. Amenorrhea was present in the majority of reported cases, excessive bleeding very seldom; but menstrual disturbance is probably not important. Suspicious points in the history will be the chronicity, the presence of a general tuberculosis, and tuberculosis in the husband.

The positive diagnosis can only be made by detecting the tubercle bacillus in the histologic structure of tubercle tissue in scrapings from such a uterus. The tubercle bacillus has been found with varying frequency both in the secretions from the uterus and in uterine curettings (Walther, Veit, Páraire). In the beginning stages of the disease their scarcity renders a diagnosis by this means extremely difficult, but in the more advanced forms the bacilli are numerous. When not found by microscopic examination in curettings their presence may be demonstrated by injecting the curettings into the peritoneal cavity of the guinea pig. A typical peritoneal tuberculosis will develop in from twelve days to four weeks if the bacilli are present, even in small numbers.

It is to be remembered, however, that the diagnosis from scrapings and cuttings is made difficult by the fact that the tubercles are not always typical, that a simple infiltration of the stroma looks much like tubercle tissue, and that giant cells are sometimes found in an interstitial endometritis. The presence of the epithelioid cells of tuberculosis in the stroma of the mucous membrane, together with the occasional distortion of the glands, may lead to a confusion with carcinoma. Repeated bacteriological examinations may be required to clear up all doubts.

SYMPTOMS AND DIAGNOSIS OF TUBERCULOUS INFECTION OF THE FALLOPIAN TUBES

In the early miliary form of tuberculous infection of the tubes the condition is generally symptomless. When, however, deep infiltration, with or without ulceration and stenosis, occurs pain becomes marked. When stenosis occurs and distention of the tube begins the pain is still worse. As a matter of fact, however, when the tubal infection is primary, or when it is secondary to some other masked lesion, the condition is but rarely recognized until the tubes are exposed in an operation undertaken for some other purpose. Even then accurate diagnosis is impossible until after histological and bacteriological examinations have been made.

Not infrequently a family history of tuberculosis or the discovery of tuberculosis in other parts of the body or in the husband (Menge) serves as a starting point for the accurate interpretation of the symptoms. In cases of primary tuberculosis of the tubes an important symptom is a more profuse and painful menstruation (Martin), while amenorrhea is, of course, present in the cases of coincident phthisis. The pain may occur on one or both sides, but it must remain a question as to how much of the pain depends upon the tube and how much upon the peritoneum. The temperature is not elevated. Ascites may be present. Symptoms may persist practically unchanged for a long time, as has been shown by Werth, who reported a case in which the tuberculous process remained confined to the tube for two years and a half.

An extension of the process to the peritoneum gives much more characteristic features to the symptoms. A progressively increasing pelvic trouble, chronic in its nature and associated with tumor formation, the matting together of the intestines, disturbance of the rectum, and encysted ascitic fluid extending above the pubes generally indicate tuberculosis. A secondary infection by the pyogenic cocci will, of course, imitate the more acute symptoms of sepsis. Lastly, a primary tuberculosis of the tube may lead to tuberculous peritonitis, phthisis, marasmus, or septic peritonitis.

The presumptive diagnosis can be reached by the light to be derived from the history of the patient, her marital state, and the condition of her husband. Heredity is also to be taken into account.

If the tubes are not too firmly bound down the diagnosis may be greatly facilitated by feeling tuberculous nodules on the surface of the tube, on the pelvic peritoneum, or on the posterior surface of the uterus. Edebohls lays great stress on a plaque-like thickening of the peritoneum. Osler says: "The association of a tubal tumor with an ill-defined anomalous mass in the abdominal cavity should arouse suspicion at once." Tubercle bacilli *may* be found in the secretions of the uterus, even though that organ be uninvolved, and Edebohls has once aspirated an abscess of the tube and discovered tubercle bacilli in the pus. Hegar believes that a rosary-formed swelling of the tube occurs more frequently in this than in any other form of tubal disease, and has placed special stress upon a swelling of the isthmus of the tube at its exit from the uterine horn (Martin), but this is of diagnostic importance only at the time of exploratory incision. Other writers believe that a swelling in the *outer end* is the common form of tumor formation. Attention has also been called by many observers to the hardness of the tumor, but it is certainly true that these features of form and consistence may be present likewise in pyosalpingitis. It is obvious that, with the obscurity of the etiological factor and the danger of delay, exploratory abdominal section is not only justified, but demanded.

The prognosis is always grave in either the primary or the secondary form: in the former, because of the marked tendency to extend to the peritoneum or lungs, and the tendency to a secondary pyogenic infection of a caseous mass; in the latter, because all these symptoms are added to the seriousness of the primary disease. The brilliant results obtained by the gynecologist, even in advanced cases, have done much during the past few years to counteract the absolutely bad prognosis of earlier writers, and we now know that a complete cure of the condition will follow excision in a great many of the primary cases, and that life will be much prolonged in the advanced cases. We are indebted to Hegar for this radical change in prognosis.

SYMPTOMS AND DIAGNOSIS OF TUBERCULOUS INFECTION OF THE OVARIES

In the early or miliary stage the disease is practically symptomless and is not generally even suspected until encountered in the course of an abdominal operation undertaken for some other purpose. When the later or caseous stage is reached the ovaries are liable to become very painful. The diagnosis of the condition possesses a scientific rather than a practical interest, since it is impossible to recognize the earlier forms by any known means, and the later forms are either associated with disease of other organs or are operated on under a mistaken diagnosis. Martin states that we may diagnosticate a tuberculosis of the ovary when the tube end is not enlarged, but the ovary is represented by a tumor the size of a goose's egg, which is glued to the side of the uterus, and only slightly sensitive. Hegar considers the glueing of the tumor to the uterine ligament, as in parametritis, a characteristic feature. That mistakes can be made, even in the microscopic examination, is certain (Madlener), yet the appearance of perfectly typical miliary tubercles in some part of the structure is the rule, and the regular arrangement of the epithelial cells of a follicle with cement substance between them will usually serve to give a correct diagnosis. Again, the presence of giant cells does not remove every difficulty of diagnosis, since an egg follicle with a moderately thick epithelial layer, and filled by granular material, may resemble greatly the giant cells of tuberculosis. Yet in giant cells the nuclei are less regularly arranged than in a follicle, and the long axis of the nucleus is tangential in the follicle and radial in the giant cell. It becomes apparent that a thorough microscopic examination is an unavoidable necessity.

SYMPTOMS AND DIAGNOSIS OF TUBERCULOUS INFECTION OF THE PELVIC PERITONEUM

This infection is so insidious in its onset that the earlier stages are practically symptomless. Indefinite prodromata, such as loss of appetite, loss of flesh, digestive disturbance, or an afternoon fever, may be present, but many cases begin as a sudden attack of acute peritonitis with a temperature as high as 103° F., acute abdominal pain, tenderness, and ascites. These symptoms subside after a few days, and the patient continues with a persistent digestive disturbance, indefinite pains, an afternoon rise of temperature, and some tenderness. The most constant symptom of the slower form of onset is pain referred to the lower abdomen and pelvic organs, and associated with menstrual disturbance. This pain varies all the way from a continuous ache to a most intense suffering that confines the patient to bed (Kelly). It is described as a bearing-down pain, as shooting pains, or by the negro as a "misery." The pain is usually associated with tenderness over the lower abdomen.

Swelling of the abdomen and a sense of "bloating" are also fairly constant features, dependent at first almost entirely upon tympanites, but later ascites adds to the swelling. This is usually associated with loss of appetite, dyspeptic symptoms, and constipation.

Fever is a marked symptom in the acute cases and fairly constant as an afternoon rise in the more chronic forms. In the latter it reaches 99° to 100° F., and the patient complains of having "malaria" or "chills and fever."

Pain on urination is given by Kelly as the most characteristic of all the symptoms.

Berggrün and Katz have found that an abundance of fat in the stools of infants is a valuable diagnostic point. They state that, while the bile is fully secreted and acts normally to prevent putrefaction, the work of fat digestion is imperfectly done. If the observation is accurate the phenomenon is difficult of satisfying explanation.

An abdominal tumor is a frequent and striking feature of this condition. These tumors may be (a) omental, the result of sacculated collections of fluid, or (b) made up of adherent masses of intestine that have become thickened and retracted, or (c) they are formed by enlarged mesenteric glands, especially in children. They give the most confusing physical signs, yet their very anomalous nature has come to be looked upon as one of the diagnostic features of peritoneal tuberculosis. An apparently solid tumor will give tympanitic resonance, the confines and the relations of the tumor will often change between two examinations, tympanitic resonance will persist in the flanks in the presence of a considerable effusion because of the encysted condition of the fluid, and, finally, such tumors of the uterine appendages or in the region of the cecum may simulate those of pyogenic origin—eccentricities of conduct that, of themselves, are strikingly significant of the condition under discussion.

On careful bimanual examination nodules varying in size from that of a millet seed to that of a bean may often be distinctly felt on the broad ligament, the Fallopian tube, the lateral wall of the pelvis, or on the posterior surface of the uterus when this organ is pulled down by a volsella and examined *per rectum*. The sensation is that of a grater. The other conditions in which such nodules may be encountered are metastatic carcinoma, papillary cystoma of the ovary, and the small blisters of certain forms of peritonitis. Edebohls has placed positive diagnostic value on a plaque-like thickening of the peritoneum. The exclusion of abortion or gonorrhea in the presence of a lateral mass will make a diagnosis of tuberculosis probable (Morris), but it must be remembered that abortion sometimes acts as a predisposing factor in tuberculous peritonitis. The simultaneous occurrence of pleurisy with effusion, especially when this fluid is bloody, is a very important diagnostic sign. A careful personal and family history of the case should never be omitted, since heredity, the history of previous attacks of peritonitis, the history of "chills and fever," a gradual increase in the swelling, a more or less constant pain, increased in walking, an uncertain percussion note, and loss of flesh are among the most important clinical diagnostic points.

It must be remembered that the tubercle bacilli are rarely found in the ascitic fluid. But they may be found in the uterine or vaginal secretions, or the ascitic fluid may be injected into the peritoneal cavity of guinea pigs.

The acute cases may be distinguished from typhoid fever by a previous history of abdominal pain, the absence of rose spots, the absence of diarrhea and continuous fever, a distinct induration in the region of the cecum, and the absence of the Widal reaction.

Osler states that of 96 cases 30 were diagnosticated as ovarian disease. In the diagnosis between tuberculous peritonitis and ovarian cyst we are guided by the history of antecedent disease of the appendages, the rapid development of an effusion, the ill-defined nature of the fluid tumor, a coincident pleurisy, the bacteriological examination of the uterine secretions, and by a most accurate bimanual examination made *per rectum* when the uterus is drawn down.

A diagnosis may usually be made with certainty (a) when the abdominal condition is associated with extensive pulmonary disease, (b) when tubercle bacilli are found in the uterine secretions or curettings, and (c) when an anomalous mass of slow formation is found in the pelvis and is associated with an ill-defined fluctuating tumor of the lower abdomen that changes its relations from time to time.

Finally, the diagnosis has been made certain, according to some authorities, by the use of tuberculin. If no reaction takes place the tuberculous character of the peritonitis is excluded. Less weight is given to this test than formerly. I have had a number of cases in which no reaction occurred, but in which the tuberculous nature of the case was conclusively demonstrated by operation.

The only conclusive means of diagnosis is by exploratory abdominal incision, which ought to be done in all presumptive cases. The macroscopic appearances thus revealed are conclusive. The method has the additional recommendation of being incidentally curative.

As a rule, the early cases, if properly treated, do better than those in which caseous or fibroid changes have had time to occur. The cases that do well are those in patients of middle age who have a considerable effusion of fluid, either free or sacculated; while the dry forms and those cases with extensive adhesions of the intestines are likely to do badly.

SYMPTOMS AND DIAGNOSIS OF TUBERCULOUS INFECTION OF THE BLADDER

Pain is the first complaint. It is described as of the burning, scalding variety. When the bladder is full this pain is suprapubic; when the bladder is being emptied it is urethral; and when the bladder is collapsed the discomfort has its center of intensity over the vesical sphincter. In certain cases there is relatively little pain. Guiteras interprets this fact as indicating that the infection is located relatively far from the ureteral orifices or from the urethra. The pain is greatly increased by the accession of cystitis due to secondary infection.

Frequency of urination with tenesmus is another conspicuous symptom. These symptoms are nearly always associated and are correlated both as to intensity and degree. It has been noticed that both are greater, relative to the proximity of the lesion to the vesical sphincter.

Hematuria, according to Guiteras, occurs in from 15 to 20 per cent. of the cases. It may come from either the kidney or the bladder. When it comes from the kidney the blood is liable to be copious; when from the bladder it is more scanty. This bleeding may come on whether the patient is active or in repose. When it comes on it is liable to be persistent, with a tendency to grow worse at times. As a consequence the urine may be obtained to almost any shade, from a pinkish to a dark reddish-brown, or from an amber to a deep yellow.

The urine in these cases may be either clear or cloudy, varying in color from amber, yellow, or pink to a dark brown. The specific gravity is generally 1.020 and the reaction is acid. Albumin and mucus are generally present. Blood corpuscles, epithelium, pus and kidney elements, including hyalin casts, are generally found. The centrifuged specimen will generally yield tubercle bacilli, staphylococci, some streptococci, and other microorganisms.

Cystoscopic exploration is often far from satisfactory. With a reunitive urethra and bladder the manipulation is usually exceedingly annoying. The capacity of the bladder is liable to be reduced to 2 or 3 ounces. The contained urine is liable to be turbid, with the effect of obscuring the field. When the bladder has been washed until the fluid is clear it is liable to be made opaque by a sudden discharge from one or both kidneys. When it is possible to get a picture the condition revealed is identical with that already described in connection with the pathologic changes.

Cystoscopic examination is instrumental in excluding tumor, stone, and other foreign bodies from the diagnosis. Stricture of the urethra, quite common in women, is also to be taken into account in connection with frequency of urination with tenesmus. Exploration with the sound berculous kidney, even when no tubercle bacilli can be found. In later stages mixed infection may occur and the urine may be found to contain the ordinary pyogenic microbes as well as the tubercle bacillus. During the early stages there is usually no fever, but later a rise of from one to two degrees is noted toward evening.

The prognosis of tuberculosis of the kidney in general is not good, and when both kidneys are involved it is certainly bad, although recovery is possible. In primary unilateral tuberculosis, where the kidney involved is removed, the prognosis is very good. Harris has patients living five and six years after nephrectomy for unilateral tuberculosis, who are in perfect health. When the bladder becomes affected and mixed infections are present the prognosis is again bad.

A careful cystoscopic examination should be made to determine the condition of the interior of the bladder, the presence of one or both kidneys, and the character of the urine to be derived from each. Ureteral catheterization should be practiced to determine whether or not both kidneys are affected. The urines thus segregated should be separately examined. The presence of tubercle bacilli in purulent urine derived from one kidney is conclusive as to the infection of that kidney. Diagnostic exclusion of renal calculus, renal tumor, hemorrhagic nephritis, movable kidney, cystic kidney, and, lastly kidney infection by other organisms enables the surgeon to arrive at a positive diagnosis.

SYMPTOMS AND DIAGNOSIS OF TUBERCULOUS INFECTION OF THE RECTUM

Patients afflicted with this infection are usually much debilitated, have a sallow complexion, pinched face, sunken cheeks, prominent ears, clubbed nails, absence of fat in the ischiorectal fossa, and patulous anus surrounded by abundant long, silky hairs. Many have an ugly cough and occasional hemorrhages, and are bothered with annoying night sweats. An ulceration, fistula, or stricture of tuberculous origin bleeds less and is freer from pain than a similar condition from other causes. The mucous membrane is pale and thin, and the discharge from the diseased area is profuse, watery, and rice-colored. Fistulous openings, instead of being small, as in the ordinary fistula, are large, irregular in shape, bluish around the edges, and droop into the opening because of the undermined skin. A probe can be inserted along the sinus without pain or difficulty. Those accustomed to treating rectal diseases have little trouble in distinguishing between the ordinary and the tuberculous types of fistula.

(1) Infection by the *Bacillus tuberculosis* is always primarily local, although it may manifest itself coincidentally in various foci.

(2) The infection once established, it may progress (a) by contiguity of structure; (b) by carriage in secretions; (c) by transit through the blood channels; (d) by transit through the lymph channels.

(3) The resistance to the infection, local and general, is expressed by the resistance index of (a) the epithelial protective layer, (b) the subepithelial or deeper tissues, vessels, and glands, and (c) the general system.

It is with this understanding, based upon the first two facts given, that I have been discussing the genitourinary manifestations of this infection in women. It now remains to speak of the practical application of the third fact, which takes up the question of resistance to the invasion. The treatment thus demanded may be divided into:

(a) General supportive treatment.

(b) Medicinal treatment.

General supportive treatment is directed to the maintenance of the system as nearly as possible at its maximum of vitality.

To this end, by common consensus, *fresh air* has a leading place. The general recognition of this fact finds expression in the rapidly growing modern custom of sleeping out of doors, on roofs, in tents, or, more particularly, on porches erected for the purpose—one of the best practical results of the world-wide antituberculosis campaign.

However local the lesion, the victim should be given the benefit of practically constant open-air treatment.

In carrying out this feature care should be taken not to lower the resistance of the patient by sudden chillings or by prolonged exposure of the body surface to cold.

Food should be of the best and most nutritious. In selection of the articles of diet the usual dietary of the patient should be taken into consideration. Damage is not infrequently done by arbitrarily changing the dietetic habits of the patient. Nothing can be more reprehensible than the giving of the patented "foodless foods" with which, back of scientific-sounding formulæ, commercial enterprise profits from popular gullibility. I found one of my cases taking some of this stuff in association with a kind of inert weed—a tabloid for nutrition—and hay for bulk. No undue attempt should be made to force the nutrition by a process of stuffing which all too frequently results in breaking down the digestion. The normal rhythm of taking meals should be observed in all but exceptional cases. There should be a normal balancing of proteids and carbohydrates, with a tendency to give the latter preponderance. Lean meats should be eaten, but are of least value. Fats should be taken *ad libitum* in every form agreeable to the palate.

Fat meats, butter, and sweet fresh oils, such as are used for condiments, are better than offensive fish oils that shortly upset the digestion and thus do more harm than good. Milk, eggs, bread, and such vegetables as ripe peas, beans, rice, and potatoes, properly prepared, are articles to be adopted. It should be remembered that our Indian corn, or maize, has a higher calorific value and carries proteids and carbohydrates in better proportion than any article on the list. It can be prepared in many different ways that are agreeable to the palate and will be tolerated longer than any single article with which I am acquainted. If the digestion is seriously impaired meat juice, kumyss, milk, plasmon, and raw eggs, when tolerated, must be relied upon.

The clothing ought at all times to be light and warm. Enough wool should be worn to prevent sudden chillings of the body, but not enough to exhaust the patient by its weight. Light woolen blankets should be worn next to the patient that sleeps out of doors. In severe weather, with the temperature hovering near zero, a woolen hood or cap should be worn, leaving space only for the eyes, nose, and mouth. An excellent and simple means of maintaining the general body warmth is to place an ample rubber sheet over the bed, beneath which a lantern is kept lighted. If the rubber sheet drops to the floor on both sides and at the foot of the bed the captive heat will ascend and materially elevate the temperature. Care must be taken that this step is not overdone. Care must also be taken that the patient is not chilled on arising from an outdoor bed. To avoid this soft woolen pajamas made with closed, baggy legs may be worn.

Rest should be insisted upon. This should be physiological, when possible, but induced if not otherwise obtainable. Since Mr. Hilton enunciated the value of rest in the treatment of inflammation the principle has been applied to the treatment of tuberculosis. A tuberculous organ or area demands rest equally with any other inflamed organ or area. Sir Almroth Wright has shown that movement, mechanical or otherwise, but especially by massage of the seat of invasion, may send an undue amount of tubercle toxin into the circulation, and as a result not only is the opsonic index lessened, but definite toxic symptoms are provoked. At the same time absolute inaction would speedily become disastrous. Therefore, easy voluntary exercise, tempered to the strength of the patient, should be encouraged. Massage to the extremities, or at least remote from the seat of the lesion, may be judiciously employed.

If possible freedom from care and anxiety should be enjoined and secured. The first requisite is to instil in the patient a spirit of hope. Confidence in ultimate recovery has a positive curative value. Mental occupation of an agreeable sort should be provided.

Medicinal treatment embraces the administration of drugs or chemicals and of sera. This should have for its object the support of the patient and the neutralization of the infection. Both these branches belong to the works on internal medicine, to which the reader is referred for their further discussion.

TREATMENT OF TUBERCULOUS INFECTION OF THE VULVA AND VAGINA

Radical removal of all diseased tissue should be resorted to whenever possible. This will often require an extensive plastic operation, and it should be remembered that a considerable removal of urethral tissue can be made without impairing the function of the bladder (Kelly, Schröder, Paoli). When this is not possible thorough curetting with a sharp spoon, followed by cauterization with strong acids, may be tried and repeated as often as the disease recurs. Deep cauterization by the electropuncture serves as an excellent method of thoroughly removing the diseased tissue and securing good cicatrization. The ulcers unfortunately heal very well oftentimes under such simple applications as iodin or acids, but this cure is not permanent, and the ulcers recur. Under any plan of treatment these cases should be carefully followed up, and the slightest recurrence treated as radically as the original focus of infection. Enlarged glands in the groin should be removed at the time of the primary operation or in the instance of their later enlargement. Either as an auxiliary to the ordinary methods of treating lupus, or as an independent method, Unna advises the following lotion:

℞	Hydrarg. chlo. corr.	1 part
	Acidi carbol. or	
	Creosotæ	4 parts
	Alcohol	20 parts

Mix.

The nodules are attacked in series of tens, beginning with those at the edge of the patch. They are first punctured with an acne lance, and a minute shred of absorbent cotton moistened with the lotion is inserted by means of a sharpened stick, the cotton rotated, and allowed to remain for ten or fifteen minutes. In a few days the punctures and lupus deposits so treated have almost disappeared, and other nodules may be then similarly attacked. This method, Unna believes, has many advantages over the somewhat similar plan of treatment by means of the nitrate of silver stick.

The treatment of tuberculous infection of the vagina should be both general and local.

The general treatment consists in fortifying the resistance of the system against the further encroachment of the disease. Forced nutrition, outdoor life, sleeping out of doors, freedom from exhausting occupations, with as little medicine as possible to maintain these conditions, indicate the line of constitutional treatment to be pursued.

The local treatment should be as radical as possible when the lesion can be demonstrated to be primary; but it must be remembered that the condition is usually secondary to a much more serious tuberculous involvement of the Fallopian tubes, the uterus, the intestine, or the lungs. In these cases palliative measures alone are indicated. When the complete excision of the ulcers is possible this should be done, but we must very often limit ourselves to a thorough curetting and cauterizing of the ulcer, and a prompt treatment of every point of recurrence. Palliative measures will consist in local applications to the ulcers, the repair or cleaning of fistulæ, the maintenance of an antiseptic condition by the use of astringent and antiseptic douches.

TREATMENT OF TUBERCULOUS INFECTION OF THE UTERUS

When the disease is primary and definitely located in the cervix, or even when secondary, if the patient's life can thereby be prolonged or made more comfortable, the treatment should be radical. There are, however, cases in which the involvement of other organs or, for that matter, of the whole system occurs in which operation should not be undertaken.

Any operation undertaken for the cure of the condition must be extensive, since Cornil and others have shown that, even in recently developed and apparently superficial tuberculosis, there is already an extension of miliary tubercles along the blood vessels into the deepest muscle layers. If the uterus can be demonstrated to be free a high amputation of the cervix should be done; yet many authors insist upon hysterectomy as the rational treatment, because of the almost uniform involvement of the tubes, the difficulty of getting beyond the tuberculous process, and the fact that there is no certain method of determining the presence of a tuberculous endosalpingitis (for technique see Panhysterectomy and Vaginal Hysterectomy). Aron and Tollaud warn against forcible mechanical handling of the cervix, since we may thereby set up a general tuberculosis. Palliative measures will consist in the thorough curetting and cauterizing of ulcers, the excision of fistulæ, the treatment by local escharotics, even the actual cautery, followed by antiseptic douches.

Constitutional treatment should not be overlooked (see General Treatment of Tuberculous Infection).

In a few cases that have occurred in my practice I have done a panhysterectomy (see Procedure for Panhysterectomy) as soon as the diagnosis was made. I believe it the safer course. In this view I am upheld by Schauta, Pozzi, Fehling, and others. Some surgeons recommend simple curetting and subsequent cauterization with pure carbolic and treatment by iodoform. Sippel, Walther, Meyer, and Halbertsma report cases of complete cure after curetting, the latter after five years. Sippel has shown the healing influence of continued menstruation on disease processes in the mucosa—a fact which must not be disregarded.

It must be remembered, however, that tuberculosis of the uterus is generally secondary to tubal tuberculosis, and in the presence of advanced disease, demanding removal of these organs, there could be slight reason for preserving the uterus. The association of a unilateral tubal tuberculosis will call for a laparotomy for the removal of the tube, and a thorough curettement of the uterus. It must be remembered in removing tuberculous appendages that a tuberculous endometritis probably already exists, and that the uterus should be curetted if left behind. Kelly has found a tuberculous involvement in such cases when it was entirely unsuspected. It is well to remember that these cases should not be considered malignant, while they do represent foci of infection which, if not destroyed, will result in fatal involvement of the entire system. Of course, radical intervention in the pelvis is wholly unjustifiable when involvement of the general system is already demonstrably present.

TREATMENT OF TUBERCULOUS INFECTION OF THE FALLOPIAN TUBES

The character of this infection, its location, the pathologic changes induced in the tubes, and the menace of the disease to the life of the patient exclude from consideration all other methods of treatment but complete extirpation of the disease, whenever this end can be accomplished. This is a dictum that admits of no dispute.

In an attempt to carry it out, however, we are forced to remember that, by reason of the great difficulties, if not the impossibility, of making a diagnosis in many cases of primary tuberculosis, we are not often called upon to decide the question of treatment. Yet, when the disease is discovered during an operation done for other conditions or when a diagnosis is made there can be no question as to the advisability of radical removal. When the local disease is associated with [illegible] [illegible] it should be given as additional reason for operation rather than a contraindication. In patients suffering from phthisis the treatment of a secondary local disease becomes a much more difficult problem. In general, the condition of the patient must be carefully considered, and her chances of life weighed with and without operation. In other words, early cases should be operated on, late cases should not.

A [illegible] tuberculous [illegible] is a possible cause for hysterectomy when the uterus is also involved, and when curetting combined with the natural resisting power of the endometrium cannot be relied upon to overcome even a mild infection.

A tonic treatment, pure air, and good hygienic surroundings have the same value in tuberculous infection of the Fallopian tubes as in tuberculosis of other parts of the body.

I agree with Whitacre that the operative treatment of these cases is the only rational one, and the excellent results reported by a number of operators will justify excision, even in those cases in which the disease has extended far beyond the appendages.

Maylard raises the question as to the expediency of the drainage of a tuberculous abscess of the pelvis *per vaginam*, even as a tentative measure. There can be no doubt of the value of this step, simply to get rid of the excess of pus that might otherwise embarrass an abdominal operation. Any reliance upon the drainage thus established as a means of cure is not justified. The secondary operations should be undertaken as shortly after the abscess has been tapped as the condition of the patient will permit, if, indeed, they should not be done at the same *séance*.

TREATMENT OF TUBERCULOUS INFECTION OF THE OVARIES

This condition is so generally and intimately allied with a similar infection of the Fallopian tubes and pelvic peritoneum that the same principles of treatment obtain in all. It is my rule always to excise tuberculous organs or structures whenever it can be done with surgical safety. This rule applies to tuberculous infection of the ovaries in any of its stages or manifestations. It may be argued that the cure of miliary tubercles of the ovaries be left to spontaneous cure after opening the abdominal cavity, just as the similarly infected peritoneum is left to spontaneous cure, often with gratifying results. The sufficient reply is that, in a case in which the general condition is favorable to operation, the removal of the ovaries and Fallopian tubes will leave just that much less infection to be combated and overcome by the resistant forces of the general system.

TREATMENT OF TUBERCULOUS INFECTION OF THE PELVIC PERITONEUM

The only effective remedy so far demonstrated in these cases is that of abdominal incision, by which the peritoneal cavity is freely opened and the serum, if any, is drained away, and the lymph exudate mopped from the surface.

This is a simple remedy that offers the best prospect of inhibiting the infection, and ought, therefore, to be applied promptly in all cases in which a strong presumptive diagnosis has been made.

This treatment must yet be ranked among the empirical resources for cure. No satisfactory explanation has yet been made of the *modus operandi* by which cure is thus effected. It is highly probable that the local or retroperitoneal leukocytosis induced by the toilet of the peritoneum—i. e., by the manipulation of wiping the lymph exudate from the peritoneal surface—is responsible for the inhibition of the tuberculous process. I have long acted upon this principle, and in all cases in which caseation was not already advanced the results have been satisfactory. As I look back upon my earlier cases I find that failures were always susceptible of explanation, either by the omission of this feature or by the fact that the cases were already well advanced. Numerous theories, some in consonance with what has just been given, have been offered by various surgeons.

There is but little or no justification for deferring this interference to await the probable or improbable results of so-called conservative treatment. The very name is misleading. Valuable as these various agencies may be—and no one has a disposition to dispute their value when properly employed—there can be no such thing as "conservation" which leaves the enemy installed and hammering away at the vitality of the patient.

The principle of direct assault upon the infection should be adopted and carried out in all suitable cases, after which, but not until after which, the so-called reconstructive regimen can have a fair opportunity to achieve its desired results. My experience with the surgical treatment of these cases is in harmony with that of Wolson Cheyne, who has had "successes" in the "dry" form as well as in the "ascitic," and who avers that "all, even the gravest, forms show good results, and there is no form in which we can say that laparotomy is absolutely useless."

116. PROCEDURE FOR PERITONEAL TOILET IN CASES OF TUBERCULOUS INFECTION OF THE PERITONEUM

(1) The abdomen is opened freely in the median line and all fluid is carefully evacuated.

(2) Careful exploration is made for recent or fragile adhesions and for removable foci. This procedure is given for toilet of the peritoneum without other operative interference. The removal of "removable foci," such as infected omentum, ovaries, Fallopian tubes, or even the uterus, is, therefore, not described in connection with this procedure, although, if removal is done at all, it ought to be done at the same séance.

(3) Fragile adhesions are broken up and any large plaques of lymph exudate are wiped away from the peritoneal surface with gauze.

(4) The peritoneal cavity is then thoroughly irrigated by tepid normal salt solution, which is siphoned off.

(5) A pint of normal salt solution is then left in the peritoneal cavity and the wound is closed.

The subsequent general management of these cases, a most important feature of their treatment, is given under the title General Management of Tuberculous Infection.

TREATMENT OF TUBERCULOUS INFECTION OF THE URETHRA

Tuberculous infection of the female urethra is never primary. It occurs by extension from the vulva, the vagina, or the bladder. In certain cases a descending infection has been known to skip the bladder and involve the urethra. In such cases the infection occurs at the margin of the meatus and is essentially vulvar. As the condition is so distinctly secondary, as the pathologic processes once established are so identical, and as they have been incidentally discussed in connection with the primary infections, they will not be given further consideration in this connection.

TREATMENT OF TUBERCULOUS INFECTION OF THE BLADDER

The treatment is (a) general, (b) medicinal, and (c) surgical.

The general treatment embraces hygienic and dietetic measures (see General Management of Tuberculosis). Medicinal treatment should be addressed to neutralizing the infection and fortifying the system against its further invasion. To meet the first object local antiseptic solutions have been thrown into the bladder. They are distinctly of questionable value. If the infection has come down from the kidney they fail to reach the *fons et origo* of the difficulty. If, by rare chance, it should be primary the infection is still so deeply buried in the tissues that none but the free bacilli would come in contact with the solution. As a rule, they simply tend to aggravate the cystitis. Irrigation of the bladder might better be limited to emollient and detergent washes such as the normal salt or sodium bicarbonate solution. These washes do cleanse the bladder, and, if they are not too irritating, they are of advantage to that extent and should be employed. Guiteras states that nitrate of silver solution in strength of from 1-8,000 to 1-1,000 is not well tolerated, but that, if the bladder is first washed out with a 25 per cent. solution of argyrol, the nitrate is tolerated, in some cases as strong as 1-1,000. He states that he has absolutely cured tuberculosis of the bladder by this method alone, after having cut away any resistance in the form of stricture that may have existed in the urethra.

Guiteras gives urotropin, which is eliminated from the kidneys as formalin, and consequently exercises some antiseptic effect in transit. Sodium acetate, sodium benzoate, and potassium acetate are alkalinizing diuretics. They should be given with large quantities of water. Salol has some value, especially in correcting complicating conditions in the intestines, where in many cases are elaborated irritating toxins that are subsequently eliminated from the kidneys.

The pain and tenesmus are best relieved by the "B and B mixture" of Guiteras as follows:

℞	Tincturæ belladonnæ	ʒiss
	Sodii benzoatis	ʒiv
	Aquæ destillatæ..... ....q. s. ad	℥iv

M. et sig.: A teaspoonful in a glass of water three times a day, between meals.

A little codein may be added if the pain is severe. If the patient has a tendency to insomnia chloral may be added with advantage to the evening dose. The bromids of sodium or potassium or strontium are eligible in this same connection. Surgical treatment is addressed to the problem of drainage. This is best accomplished in the female bladder by the soft self-retaining mushroom-tipped catheter, so long as the urethra tolerates its presence. This is sometimes but a very brief period. In such instances drainage should be effected through the vagina.

117. PROCEDURE FOR DRAINING THE BLADDER THROUGH THE VAGINA

(1) The patient is placed in the recumbent position, thighs well flexed, and a self-retaining perineal retractor adjusted.

(2) A curved male sound is introduced into the urethra and its

in from six months to three years. The results of treatment are not so good in this locality, because the disease is being constantly aggravated by the passage over it of feces. The most essential thing in the treatment is to see that these sufferers get a reasonable amount of exercise in the sunshine, and are not confined in bed in a dark room. In fact, we should make everything about them as cheerful as possible. Every means should be resorted to to build them up; generally for this purpose there is nothing better than plenty of nourishing food, stimulants, and tonics, such as creosote, guaiacol, cod liver oil, malt extracts, iron occasionally, and, in fact, any tissue builder. If they can afford it nothing will do them more good than a trip to the seaside or a change of altitude. Intestinal antiseptics should be given, as they sometimes benefit these patients very much; at other times, however, they are worthless. Ulceration rarely yields to palliative treatment, though we have to rely on it now and then when operation is refused. The ulcers should be cleansed frequently, after which some stimulating or antiseptic solution or powder should be applied. If they have a tendency to spread a thorough burning with nitric or carbolic acid becomes necessary. When the treatment of tuberculosis is left entirely in Gant's hands he treats it as though it was malignant. He curettes and trims the edges of the ulcers; after this the affected area is thoroughly cauterized with a Paquelin cautery. The postoperative treatment is the same as for a granulating wound of the rectum from other causes. Tuberculous fistulæ should be laid open and all diseased tissue removed, and should then be cauterized as though they were an ulceration. Care should be used not to sever the sphincter more than once, for incontinence occasionally follows the operation. If it is thought best not to give a general anesthetic, to lose much blood, or to put the patient to bed, a ligature may be passed through the sinus and brought out at the anus, where it is tied and allowed to cut its way out. A cure will sometimes follow this method. Tuberculous stricture requires practically the same treatment as a constriction in the rectum from other causes. In the majority of cases, however, nothing short of colostomy and the prevention of fecal irritation will do any good. After this operation a radical improvement will follow.

TREATMENT OF TUBERCULOUS INFECTION OF THE BREAST

There is no *medical treatment* in these cases except anodynes, and, as they lead to drug habituation without the slightest curative tendency, their use ought to be discouraged. The *surgical treatment* of a presumptively tuberculous breast should consist first of an incision into the growth to determine the last fact in the diagnosis. If it is thus proven to be unmistakably tubercular, and only tubercular, the breast should be amputated. This may be safely done outside the pectoral muscles. In long-standing cases the axilla ought to be explored and all enlarged glands removed. When the conditions revealed by exploration are either wholly or partly cancerous the radical operation for carcinoma ought to be done (see Carcinoma of the Breast).

CHAPTER VII

BACILLUS DIPHTHERITICUS INFECTION OF THE FEMALE GENITO-URINARY ORGANS

Bacillus diphtheriticus infection, or diphtheria of the vulva and vagina, must be classified as a pure infection. The inner surfaces of the vulva and vagina are sometimes the seat of active diphtheritic exudation, which may be either (a) primary or (b) secondary. The latter form, in which the genital manifestation of the disease occurs secondarily to its appearance either in the upper air passages or other loci, is the more frequent. Leick, of Greifswald, reported a case of primary diphtheria involving the inner aspects of the labia and extending into the vagina, the characteristic exudate yielding the Klebs-Loeffler bacillus. Elsner has recorded a case of primary infection of the vagina by the same bacillus, in a puerperal case. Infection of the vulva by the diphtheria bacillus, whether primary or secondary, in very young subjects may cause noma, or circumscribed gangrene of some part of the vulvar structure.

Symptoms and Diagnosis.—The diagnosis of diphtheria of the vulva and vagina is based upon the occurrence of an initial chill followed by fever of 105° F. or more, rapid but feeble pulse, prostration—less marked, however, than when the disease attacks the respiratory passages—local tenderness, referable to the vulva or vagina, or both, which, upon inspection, reveal the characteristic pearly exudate. The absolute diagnosis depends upon the demonstration of the Klebs-Loeffler bacillus.

Treatment.—Treatment is both constitutional and topical. Constitutional treatment consists in the employment of the antitoxin; the complete disappearance of the membrane has been noticed in sixty hours following the use of two thousand units of antitoxin. When the local infection is so virulent as to cause noma or circumscribed gangrene of the external structures hot antiseptic applications should be made, and the sphacelus, as soon as well defined, should be removed, every principle of antisepsis being observed in the subsequent treatment.

CHAPTER IX

BACILLUS COLI INFECTION OF THE FEMALE GENITOURINARY ORGANS

The *Bacillus coli communis,* morphologically, consists of short rods with rounded ends, generally occurring in pairs, about 2 μ long and from 0.4 μ to 0.6 μ broad. In some instances the diameter and the length are equal, under which circumstances they may be mistaken for micrococci. They propagate both with and without oxygen, and are both parasitic and saprophytic. They are capable of slight ameboid activity. They propagate actively in acid media of abnormal temperature. There are several varieties of this bacillus, all of them possessing a common morphology, though differing slightly in habitat, behavior in similar media, and in degrees of virulence, but it is not necessary in this connection to speak of them in detail. In the normal body the habitat of the *Bacillus coli communis* is in the colon and adjacent portions of the alimentary canal. Its migration from this locus, through an infection atrium, into either the walls of the intestines or the peritoneal cavity, is fraught with serious mischief.

This may occur as a pure infection of the vagina, uterus, Fallopian tubes, or ovaries. It has also been observed as an element in mixed infection of these organs and of the bladder and kidney. It is frequently a factor in mixed puerperal infection. Deaver states that there is frequently a close relationship between acute catarrhal appendicitis and right-sided acute salpingitis. While he mentions these as separate conditions, calling for consideration of their respective symptomatology for diagnostic purposes, the causal relationship between the two is, nevertheless, suggested. The rôle of the *Bacillus coli communis* in appendicitis is well understood, but the extension of its influence to the Fallopian tube is not so easily comprehended or so generally recognized. Cases of salpingitis, however, in which the *Bacillus coli* was present have been reported by Morax, Girode, Hartmann, Doyen, and Reymond. Individual cases have also been reported by Guyon, Tuffier, and Schauta.

The intestinal origin of this infection, when occurring in mixed infections of the Fallopian tubes, is emphasized by Reymond, who which is implied that undifferentiated infection which is probably responsible for the majority of pus tubes. When, however, the *Bacillus coli* penetrates the Fallopian tubes the symptoms are more or less violent, the temperature running very high, sometimes to 105° F., following an initial chill. The rigors may be repeated, followed each time by exacerbation of the temperature, with increasing evidences of systemic intoxication, verging to the fatal point.

The bacilli are found in variable quantity in the pus; sometimes in such quantity as to suggest a drop of culture bouillon. This, however, is exceptional, as in other cases the bacteria are so rare that microscopic examination of the pus is negative, the existence of the microorganisms being revealed by cultures. Leukocytes are rare in the pus, while the epithelial cells are more numerous. The manner in which the *Bacillus coli* attacks the epithelium does not seem to be settled. If it is granted that the organism finds its way into the tube through the septum formed by tubointestinal adhesion it follows, as a logical result, that it must approach the epithelium from beneath; whereas, if the method of invasion is through the uterus, it, like the gonococcus, attacks the epithelium from its free surface. Reymond and Magill record the significant fact that in all sections made and colored by them with Nicolle's method they were never able to find the bacteria elsewhere than in the salpingoovarian pocket, in the midst of eliminated cells, and at the surface of the wall. The progressive accumulation of pus is more rapid than in the ordinary infections, and results in extreme distention of the tube, which may rupture either into the peritoneal cavity or, as more frequently happens, into the intestine.

Treatment.—The treatment is identical with that for gonococcus infection (q. v.).

of general disease which might be considered the primitive cause has been recorded. An examination of all the testimony tends to render untenable an hypothesis of the systemic origin of the infection. The probability of its entrance through the genital tract seems to be better founded. The cases of Witte and Frommel show that the infection was consecutive to puerperal accidents; while gonorrhea was the antecedent factor in the cases of Girode and Zweifel. The facts, however, that the pneumococcus exists normally in the saliva, and that among certain people of depraved habits the saliva is sometimes used as a lubricant in vaginal manipulations, may explain its presence in that canal, where Doyen and others assert that they have found it. In view of the fact, however, that its normal medium is alkaline, it is hardly to be assumed that it will find a congenial environment in the presence of the acid products of the bacillus of Döderlein. The assumption, therefore, that the pneumococcus is to be classified among the normal bacteria of the vagina seems to be gratuitous.

Symptoms.—The symptoms in the cases on record are those of an acute onset followed by high temperature. It would seem either that the pneumococcus is of varying virulence or that the patients possess different degrees of susceptibility, since the escape of pus into the peritoneum in Zweifel's case caused no accident, while it proved rapidly fatal in the cases reported by Frommel and Witte. The symptoms are otherwise essentially those of mixed infections of the tubes and ovaries.

Treatment.—See Gonorrheal Infection of the Fallopian Tubes; also of the Ovaries.

CHAPTER XI

STAPHYLOCOCCUS INFECTION OF THE FEMALE GENITOURINARY ORGANS

As pure infections the staphylococci play but a minor rôle in gynecic pathology. The condition, i. e., a pure infection, probably never exists as a clinical entity in the vulva, vagina, or uterus. It is alleged that this form of pure infection often exists in the Fallopian tubes. Contrary to the general impression, however, the condition is very rare, if, indeed, it can be said to exist at all. As a matter of fact, these microorganisms are not demonstrably present in a large proportion of salpingitides. Schauta found them but 4 times in 144 examinations. Menge found them once in 26 cases, Morax once in 33, while Witte found them but twice. Boisleux reports that he has observed them several times. It is a notable fact that several observers who have found them have discovered other pathogenic microorganisms present in the same cases. Reymond and Magill have failed to find them, and, while not denying the accuracy of other observations, suggest that confusion may have arisen from the fact that there are found in and near the Fallopian tubes saprophytes which may easily be confounded with the white and golden staphylococcus. The microscopic illusion is heightened by the fact that these saprophytes offer the same appearance on the slide, and show cultural properties similar to the staphylococci. As yet understood, these pure infections have no special symptomatology or treatment.

Staphylococci in various forms are exceedingly important factors in practically all mixed infections (see Mixed Infections).

CHAPTER XII

SAPROPHYTIC INFECTION OF THE FEMALE GENITOURINARY ORGANS

Witte has observed harmless bacteria in company with those possessing pathogenic properties in the Fallopian tubes, but, like Reymond, has not come to a conclusion as to their proper classification. The latter notes the significant fact that they resemble the species which normally inhabit the lower portion of the genital tract, but is not prepared to believe that they are indigenous to the tubes. The conclusion of Sir William Sinclair that the Fallopian tubes are normally free from bacteria is in accordance with this view. The explanation of their presence in the tubes rests upon purely theoretic grounds. The fact that they are always found in connection with pathogenic bacteria suggests that they migrate thither under the escort of their more virulent congeners. They do not penetrate deeply into the mucosa, but live upon its surface. In those cases in which they seem to be more deeply imbedded it is found, upon careful examination, that they are actually within an epithelial cul-de-sac, which has become more or less displaced by the inflammatory thickening of the membrane. They are not discoverable in the muscular tunic.

CHAPTER XIV

MIXED INFECTIONS OF THE FEMALE GENITOURINARY ORGANS

Mixed infections, as explained at the opening of the chapter, must be discussed under the titles of the respective entities to which they give rise. It should be stated that even this classification must be somewhat arbitrary, in view of the fact that certain of the conditions given are not always limited to the *anatomical* parts implied by their respective titles.

In each instance a mixed infection is caused by two or more demonstrable varieties of microorganisms. Sometimes many such varieties are encountered. Ordinarily the only varieties represented are those whose normal habitat is in or about the infected area (see Bacteria of the Normal Genitourinary Tract). The displacement and consequent infection come as the result of influences that impair or, at some point, destroy the resistance of the epithelial coat. Traumatism, maceration in secretions, and the irritating influence of local discharges and medicaments are to be considered among the active causes.

In no instance of a true mixed infection does any one microorganism play an overshadowing rôle in producing the clinical phenomena that follow. It should be remembered that any of the bacteria about to be considered, and, for that matter, any of the pure infections, may figure as secondary invaders in converting a pure infection into a mixed infection.

BACTERIOLOGY OF MIXED INFECTIONS OF THE FEMALE GENITOURINARY ORGANS

The microorganisms that occur most frequently in mixed infections of the genitourinary organs of women and that, therefore, call for special consideration in this connection are (a) *staphylococci* and (b) *B. aerogenes capsulatus.*

(a) Staphylococci.—Staphylococci, although occurring in several varieties, have a more or less common morphology in the particulars that they are (a) small, spherical cells; (b) that they vary from 0.7 μ to 0.9 μ in diameter; that they occur singly, in pairs (diplococci), frequently in fours (tetrads), or in masses (zooglea). The varieties about to be considered differ from each other chiefly in color, the character of the pigment they throw off, their behavior in different media, their degrees of virulence, and, finally, in the particular of their natural habitat. While there are other varieties of staphylococci, but four will be considered in this connection, viz.:

(1) The *Staphylococcus pyogenes aureus* is the most common pathogenic micrococcus. Having the morphologic feature already mentioned, it is only important to add that it multiplies rapidly at normal temperatures in nutrient media. While growing in gelatin, which these cocci liquefy, they accumulate near the surface, producing, when brought in contact with the air, a characteristic golden-yellow pigment which is precipitated to the bottom of the tube and from which they take their name. Sternberg gives the thermal death point in moist media at from 56° to 58° C. (132.8° to 136.4° F.), but, when dried at from 90° to 100° C. (194° to 213° F.), these germs grow in either the presence or absence of oxygen, and are capable of reproducing themselves when transplanted from nutrient media at the end of a year, and they have been found alive at the end of ten days after having been dried on a cover glass. Their natural habitat on the body is the cutaneous and mucous surfaces, although they have been found in the salivary secretions, in the dirt under the finger nails, and in the mucus from both the pharynx and nose; they have also been found in the soil, the air, and water, upon the surface of fruits, and on the petals of a rose. The pus-forming quality of this coccus is beyond doubt. Von Eiselberg and Netter have shown that it is transported by the blood to other parts of the system, but there is no conclusive evidence that it multiplies within that medium.

(2) The *Staphylococcus pyogenes albus* is precisely like the preceding in morphology, except that it is not pigmented. Surface cultures made from this coccus are milk-white, from which fact it takes its name. According to Rosenbach, who discovered it, this albus occurs more commonly among the lower animals than does the aureus. Pathologically it is often found alone in acute abscesses, but more frequently in company with other pyogenic bacteria. It is probably identical with the microorganism next to be described.

(3) The *Staphylococcus epidermidis albus* (Welch) has physical properties precisely like those of the preceding, but differs from the aureus in color, in the fact that it liquefies gelatin more slowly, that it is less virulent when introduced into the tissues, and that it may be present in wounds without causing pus. This latter statement is made by Welch in face of the declaration that it has been demonstrated to

be the frequent sole cause of suppuration along the drainage tube and in stitch abscesses. Its natural habitat is the skin, into the interstices of which it is frequently buried so deep as to be beyond the reach of the agents usually employed in hand sterilization. This was interestingly demonstrated by Craig, who, in a search for malarial organisms in a fever patient, sterilized the palmar surface of the latter's finger, which he pricked deeply with a needle previously sterilized in an alcohol flame. Three drops of the resulting blood were thrown away; the top of the next drop was touched with the point of a sterilized platinum wire and a stab culture in agar made. Three cultures were thus made, two of which proved negative, while the third yielded the *Staphylococcus epidermidis albus* of Welch. While this is an isolated observation it tends to show that, even upon a palmar surface, in the absence of sebaceous glands and hair follicles, this coccus may be situated so deeply as to elude careful antiseptic precautions.

(4) The *Staphylococcus pyogenes citreus,* while having morphologic features in common with other micrococci, differs from them in the particulars that its colored pigment is a lemon-yellow, that its pigment is formed only in presence of oxygen, that it is slowest of all of the micrococci in liquefying gelatin, and, finally, that, although it is found with other bacteria in acute abscesses, its own pathogenesis is undetermined.

(b) Bacillus Aerogenes Capsulatus.—The *Bacillus aerogenes capsulatus* (Welch) occurs ordinarily as a straight but sometimes slightly curved bacillus, with ends that may be square or slightly rounded, and from 3 to 6 μ in length. It has a transparent capsule, is without the power of spontaneous movement, is sporeless, thrives without oxygen at normal temperature, and generates gas in large quantities in all culture media. Animals inoculated with this bacillus speedily die, the bacillus propagating rapidly and developing gas in the dead tissues. It is the bacillus most probably responsible for the gas which occasionally occurs in tissues in connection with suppuration.

The essential clinical manifestation of a mixed infection is inflammation. So true is this that it may be said where there is no inflammation there is no infection.

The natural classification of the subject as it thus develops must contemplate a consideration of

(1) Mixed infection of the vulva (vulvitis).
(2) Mixed infection of the vagina (vaginitis).
(3) Mixed infection of the endocervium (endocervicitis).
(4) Mixed infection of the endometrium (endometritis).
(5) Mixed infection of the Fallopian tubes (salpingitis).

[illegible]

[illegible]

[illegible]

MIXED INFECTION OF THE VULVA

[illegible]

[illegible] significance. [illegible] conditions. [illegible] the following, viz.:

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

INTERTRIGO OF THE VULVA

(Mixed Infection)

[illegible] an inflammation involving the [illegible] layers of the derma and although the most [illegible] are moisture and friction of the involved [illegible] the phenomena of mixed bacterial infection. [illegible] *pallida* or any of [illegible] the vagina and thereby [illegible] may be leading factors of causation.

[illegible] found in fleshy women. It is [illegible] surfaces of the skin of the thighs [illegible] external portion of the labia majora, and [illegible] friction. Under these circumstances perspiration is very [illegible] the epidermis and causes an inflammation [illegible] beginning, is limited to the degree of a simple [illegible] continuing, reaches the degree of a true eczema. Indeed, [illegible] the surface of the inguinocrural fold and of [illegible] red and moist, and the epidermis appears slightly macerated. An itching and burning sensation is associated with the affection. If promptly treated the skin returns to the normal condition in a short time. If the affection is allowed to continue, then, on account of the profuse perspiration and of its chemical changes, associated with impurities and uncleanliness, the epidermis is deeply macerated, the surface is excoriated, oozing a serum which starches the linen, and the patient can scarcely move on account of the pain produced by the motion on the inflamed skin. Although the affection is called *eczema intertrigo,* Ravogli (1) does not consider it a true eczema.

Eczema may be the consequence of the intertrigo, just as it may follow any other irritation of the skin. The large quantity of seropurulent secretion oozing out of the vagina in cases of gonorrhea moistens the skin of the genitals and of the thighs, and by its irritating qualities causes intertriginous eruption. This intertrigo is also found in patients who observe strict cleanliness. In women neglectful of the principles of hygiene the intertrigo assumes a much more aggravated form. In the first case the affection is limited to the front part of the genitals, labia majora, labia minora, and clitoris with its prepuce, as a result of the contact of the gonorrheal fluid on the skin. In the second case intertrigo is spread more on the internal surface of the thighs and of the labia majora in the fossa genitocruralis, in consequence not merely of the presence of the purulent secretion, but also of the friction of the two surfaces of the skin, which become macerated by the purulent secretion, perspiration, and other impurities. Intertrigo in these cases is acute, the surface of the affected skin is red and somewhat swollen, the epidermis is macerated, giving it a whitish, soggy appearance, abrasions and small rhagades are formed on the labia majora in an oblique direction toward the fossa genitocruralis, the surface is always moist from the discharge of serum, which, together with the gonorrheal secretion and the perspiration, produces an offensive smell. A burning sensation accompanies the course of the affection and motion makes it so painful that the woman can scarcely walk.

Another form of intertrigo, more chronic in form, but occurring under the same circumstances, was recently described by L. Brocq and Léon Bernard. It is limited to the genitocrural fossa, and, when the woman is placed in the position used for the speculum examination, it appears like a triangle with the base at the fossa and the apex downward on the upper lateral side of the thighs. The skin is of an intensely dark red color, showing deep furrows in an oblique direction, and between them follicles can be seen. The pigmentation is very deep, due partly to the inflammatory process and partly to the chromatogenous condition of these regions. A kind of small, flat, papillary growth can be seen on the surface like a lichenization, which is due to a proliferation of the connective tissues in the papillæ with some hypertrophy of the epidermic layers. When the inflammatory process lasts for a long time the papillæ become infiltrated with cells, and their connective-tissue corpuscles may increase in their nutrition and proliferate, producing small, flat, papillary warts as a consequence of the irritation.

Diagnosis.—To distinguish intertrigo the preceding clinical features should be carefully taken into account. To distinguish this disease by pathologic alterations from eczema and dermatitis is an impossibility. Ravogli, in reply to the question whether this affection, being of an inflammatory character, is to be classified as an eczema or a dermatitis, replies: "It is a question of degree; it progresses from a pale rose-red color to a deep reddish-violet color."

Intertrigo is also found in syphilitic women, often accompanying the presence of mucous patches in the secondary stage. The secretion oozing from *syphilitic eruptions,* which in that region are usually ulcerated, causes the maceration of the epidermis, and intertrigo is the result. In these cases the first thing to do is to treat the mucous patches, and with cleanliness the intertrigo easily disappears.

Treatment.—In intertrigo cleanliness must be observed so as to remove all impurities from the irritated surfaces of the skin. After washing and drying the surface is covered with rice powder or starch powder, to which may be added a small quantity of boric or salicylic acid (2 to 100).

When the epidermis is excoriated the surface is sore and there is a great deal of serous secretion. Ravogli finds of great advantage the use of bathing with some astringent solution. The solution of subacetate of aluminium and lead, known as Burrow's solution, 3 per cent., applied on lint, in order to separate the skin surfaces from each other, is very beneficial. If the patient can remain in bed, with a few applications of this solution the intertrigo will easily disappear; but, if the patient must attend to her occupations, then bathing may take place morning and evening, and during the day some salve may be applied, such as Wilson's ointment, or an ointment of:

℞ Zinci oxidi
Bismuthi subcarbonatis ....āā ʒss
Acidi carbolici .... gtt. x
Vaselini .... ℥j
M. Fiat unguentum.

This can be rubbed on the surface, and particularly upon the labia majora, which should be kept separated from the thighs by means of soft lint.

In chronic intertrigo with papillary hypertrophy it is necessary to use more active remedies. Two or three applications of Wilkinson's ointment:

℞	Sulphuris sublimati Picis liquidæ Saponis viridis	āā ʒvj
	Terræ albæ	ʒiij
	Apidis suis	℥j

M. Fiat unguentum.

have given good results, for, by causing the desquamation of the old epidermis, we obtain a new soft epidermis. The application of a resorcin salve can also be recommended:

℞	Resorcini	ʒss
	Acidi salicylici	gr. vj
	Vaselini flavi	℥j

M. Fiat unguentum.

When the epidermis has returned to its normal condition, and the serous secretion has stopped, the only way to finish the treatment and prevent any relapses is to use scrupulous cleanliness, and, after washing, to dust the genitals and genitocrural region with one of the recommended dusting powders.

ERYTHEMA OF THE VULVA

(*Mixed Infection*)

This is always a mixed infection of the vulvar epidermis and frequently of the deeper structures, the pus formers always being largely represented. The condition may result from a number of initial causes. Obstinate erythema affects the female genitals in consequence of glycosuria, and, indeed, it is the duty of the physician, when he finds cases of erythema localized in the genitals, to examine the urine. In these cases the labia minora are red and slightly swollen, the labia majora are red and swollen, the color is rose-red, of an intense hue, and the epidermis, distended from the scanty exudation of serum, takes on a smooth, silky, and glossy appearance. This erythema sometimes spreads to the internal surface of the thighs, but in the usual cases it remains limited to the genitals. Excoriations are found on the reddened and swollen surface of the skin, produced by the act of scratching, because this glycosuric erythema is often accompanied by a persistent itching sensation—pruritus vulvæ. Pruritus is in these cases very intense, and the patient cannot restrain herself from scratching in order to stop this disagreeable itching sensation. This deprives the sufferers of their sleep at night, and the constant scratching irritates the skin so much that it produces a persistent edema or pustules and superficial ulcerations.

Treatment.—It is necessary to subject the patient to ordinary diet of diabetics, by forbidding all amylaceous food, and thus diminishing the quantity of sugar in the urine. These dietetic rules must be accompanied by the use of some mild purgative mineral waters, like Carlsbad, Apenta, Hunyadi Janos, Blue Lick, Congress, etc., taken regularly every morning in a dose of from half a glass to one glass, according to the tolerance of the patient. For local treatment the most important rule to follow is cleanliness. The external genitalia and the vagina are to be thoroughly washed with green soap and water and then irrigated with a 2 per cent. solution of carbolic acid. The patient is advised to remain in bed and apply compresses with liniment of oil and lime water, to which may be added from 2 to 4 per cent. of ichthyol. When the patient gets up she may make an application of Wilson's salve or the suggested formula of oxid of zinc and subcarbonate of bismuth. Lassar recommends the following formula:

℞	Acidi phenylici	1 to 2 parts
	Hydrargyri sulphidi rubri......	1 part
	Sulphuris sublimati	25 parts
	Vaselini americani	100 parts
	Olei bergamottæ	gtt. xxx

M. Fiat unguentum.

This mixture, as it contains a great quantity of sulphur, without causing irritation, prevents the development of the pus germs which so often occur in the skin of diabetic persons.

ECZEMA OF THE VULVA

(*Mixed Infection*)

While this is always a mixed infection, the *Staphylococcus pyogenes albus* is the most offending causative agent when propagated on the deeper layers of the skin.

Acute eczema may affect the vulva, implicating the labia majora and minora, clitoris, and the mucous membrane of the vagina, spreading along the periphery to the upper portion of the thighs. Along with the burning and itching sensation a diffused redness and swelling affect the parts mentioned, and presently small vesicles appear, which soon break, causing a discharge of serum which moistens the linen.

Chronic eczema, however, is the form more often met with when localized upon the female genitals. It often occurs in the form of eczema rubrum, affecting the labia majora, labia minora, and the mucous membrane of the vagina. The labia majora are red, swollen, and infiltrated, and, in consequence, the rima vulvæ is opened by the distention of the labia. On account of the unbearable itching sensation numerous excoriations are produced by the action of scratching and rubbing. In many cases the eczema spreads to the upper portion of the thighs, and also to the mons veneris. On account of the spreading of the affection to the vagina an abundant secretion oozes out of the genitals, which increases the intensity of the affection. In order to be sure that the secretion is not of a venereal origin Ravogli always makes a microscopic examination of it so as to exclude the possibility of the existence of gonorrhea.

Eczema of the vulva may, by continuity, very easily spread to the perineum and to the anus. The parts are red, thick, and excoriated, and serum oozes from the excoriations. Sometimes the excoriations are covered with crusts, but where there are opposing surfaces these become more or less glued. At other times no discharge takes place; the skin is rough, dry, and slightly scaly. It is always accompanied by a violent itching sensation, which causes great misery. This form of eczema may be the result of a local irritation, leukorrhea and gonorrhea being the most effective factors; or it may be the result of the scratching and tearing of the skin incident to intertrigo. It may also be of reflex origin, or it may be referable to the presence of uterine disorders.

Treatment.—Ravogli has always obtained good results by the application of ichthyol in different formulæ. First, care has to be taken to improve the condition of the vagina by means of irrigations with a solution of biborate of sodium, which the patient will repeat twice a day. Every other day Ravogli inserts into the vagina a tampon saturated with a mixture of 25 per cent. ichthyol in vaselin or glycerin, which the patient will leave in the vagina for twelve hours. Externally he directs the patient to apply for a few minutes a solution of carbolic acid, which relieves the itching sensation and sterilizes the affected skin. The formula which he employs is:

℞	Acidi carbolici	ʒj
	Glycerini	ʒij
	Alcoholis	℥ij
	Aquæ rosæ	℥iv

M. Fiat linimentum.

At first the patient complains of some burning sensation, but she is soon willing to repeat the application for the relief which it affords to the itching. After this application the patient is directed to apply pieces of lint well saturated with the following liniment:

℞	Ichthyolis	ʒij
	Olei amygdalæ dulcis Aquæ calcis	āā ʒiv
	Glycerini Aquæ rosæ	āā ℥j

M. Fiat linimentum.

The use of salves is to be avoided in this condition, because the abundant secretion, together with the salve, makes rather an irritant mixture.

After the repeated applications of the ichthyol liniment in the manner described the surface of the skin begins to heal up, the itching sensation greatly diminishes, the swelling and the redness nearly subside, and at this point there may be applied a salve of oxid of zinc which will finish the treatment. The formula for this salve is:

℞	Zinci oxidi Bismuthi subcarbonatis	āā ʒss
	Acidi carbolici	gtt. x
	Vaselini flavi	℥j

M. Fiat unguentum.

When the skin has returned to its normal condition it will retain some redness as the result of the past trouble, for the relief of which Ravogli advises the patient to continue the use of the lotion of carbolic acid twice a day, and, after drying the surface, to dust the skin with an innocent powder, as starch or rice powder, to which some oxid of zinc or subcarbonate of bismuth may be added.

FOLLICULITIS OF THE VULVA

(*Mixed Infection*)

Infection of the hair follicles of the vulva, like sycosis of the beard, may be of double origin, either the result of the fungus of the ringworm or the result of the development of the pus germs in the follicle of the hair. In both cases which Ravogli had occasion to study the pus cocci were the cause of the disease. In both cases the affection started from a superficial eczema and had developed until the surface gradually became covered with pustules, conical in shape, each one having a hair in the middle.

It is easy to understand how the pus germs find their way into the follicles of the hair. The opening from which the hair passes through the epidermis is lined with epidermic cells, forming a kind of funnel around the shaft of the hair. According to Bockhart, the pus germs capable of producing this affection are the *Staphylococcus albus, aureus,* and *citreus,* the same that can produce impetigo and furunculosis. On account of an inflammatory process, especially eczema, the germs find the follicular openings more easy of access than in the normal condition, and insinuate themselves into the follicles, thus causing inflammation of the tissues forming the follicle of the hair and of the surrounding tissues. It will be seen that this is nothing more than a spreading of the process by continuity, when it is remembered that eczema is only the result of the production and development of the *Staphylococcus pyogenes albus* in the layers of the epidermis.

The hair follicle, inflamed and swollen, is converted into a small abscess, as proved by Wertheim. A transudation of serum and white corpuscles of the blood takes place in the hair follicle, producing a hydropic condition of the membranes covering the root of the hair. The root is softened and swollen by seropurulent infiltration, and in consequence the hair is easily removed, having no adherence. The papilla is usually spared from destruction, and this is the reason why in all cases of sycosis the hair is easily reproduced.

Symptoms.—As in ordinary cases of sycosis, the folliculitis of the female genitals is revealed by the presence of pustules or papulopustules, each one being perforated by a hair. The pustules are conical in shape and contain a drop of pus at the point surrounding the shaft of the hair. The skin of the labia majora and of the mons veneris, when affected with folliculitis, is usually red and inflamed. This is accompanied by a burning and itching sensation. This affection is often associated with boils in the same region or in the neighboring parts of the thighs or abdomen, caused by the inoculation with the staphylococci effected by the finger nails in the act of scratching.. This affection of the follicles of the hair of the woman's genitals, although chronic and obstinate, is not so difficult to treat as sycosis of the beard. It may be said that, without the necessity of removing the hair, either by shaving or by epilation, this disease can be easily treated, yielding readily in a few weeks to the action of remedies.

Treatment.—Of course, the general system should not be neglected, although the disease is a local one. The condition of resistance of the organism to the development of the pus germs is very important, and when we begin the treatment it is necessary to establish a plan of general medication. If the patient is in an anemic condition prescribe ferruginous and tonic preparations; if she is suffering from a scrofulous condition the use of cod liver oil will be of great advantage. In case the woman is inclined to gout, or if she perspires a great deal, we must prescribe antigout remedies, such as lithia, salol, salicylates, etc.

The local treatment consists in enforcing rules of cleanliness. Ravogli uses with good results an application of compresses well saturated in an astringent and antiseptic solution, and frequently repeated; also compresses saturated with a mild solution of bichlorid of mercury (1 to 1,000) for half an hour twice a day, followed by the application of a salve, such as Wilson's ointment. In more stubborn cases the following formula can be used with good results:

℞	Acidi carbolici	gr. v
	Bismuthi subnitratis	℥ss
	Unguenti hydrargyri ammoniati	ʒij
	Unguenti aquæ rosæ	ʒiv

M. Fiat unguentum.

The application of ichthyol is highly recommended. This is used in liniment form applied on lint, or in the form of salve, 10 per cent., in association with zinc ointment and 2 per cent. betanaphthol. Salves containing sulphur, from 4 to 6 per cent., are also found very useful. It can be applied in the form of Lassar's paste:

℞	Sulphuris sublimati Zinci oxidi Amyli oryzæ	āā j
	Acidi salicylici	gr. x
	Vaselini	j

M.

With this treatment and without any necessity of epilating, as in the case of sycosis of the beard, we can obtain good results in a short time.

HERPES PROGENITALIS OF THE VULVA

(*Mixed Infection*)

The clinical course of herpes progenitalis of the vulva indicates that it is a mixed infection, and Rohrer (1) found diplococci in the serum of the vesicles, although Pfeiffer (2), in a case of menstrual herpes, could find no microorganisms. It is often superinduced by gonorrheal infection of the vagina, and the microorganisms of discharges from the vagina, uterus, and even the Fallopian tubes play an important part.

This condition occurs as an eruption of vesicles disposed in groups in an acute form, and is often found on the genitals of women. It corresponds to the herpes preputialis which, with the same frequency, occurs in the male sex. This eruption appears on the internal surface of the labia majora, on the labia minora, on the vestibule and prepuce of the clitoris, at the orifice of the urethra, occasionally on the external surface of the labia majora, and at times it spreads to the mons veneris. Ravogli has twice seen groups of vesicles on the cervix uteri, corresponding with the observations of Bergh (Ueber Herpes Menstrualis), who has seen similar eruptions, sometimes accompanied by herpes of the vulva.

Before the outbreak of the vesicles there are in most cases slight burning and itching sensations. Only rarely is the itching very pronounced, and it accompanies the course of the affection.

The eruption consists of a single vesicle, or of a group of vesicles closely arranged, or of vesicles scattered on the surface following the ramification of a nerve. It begins as a red patch, which in a few hours shows vesicles. These are usually small, from the size of a pinhead to that of a hempseed, round, transparent, containing clear serum. When affecting the mucous membrane, on account of the succulence and the thinness of the epithelium, they soon break, while on the skin they remain longer. Their contents become turbid and soon form brownish-yellow crusts.

Herpes seated on the labia minora may cause edema of these parts, on account of the tenderness and laxity of their tissues. The vesicles, when broken, leave a superficial exulceration corresponding to the size of the vesicle. The bottom is of a rose-red color, sometimes covered with yellow detritus, with the edges cleanly cut, but not deep, and never as in chancroid. They are usually arranged in a group, and, when broken, the remaining exulcerations coalesce into one patch with festooned edges, reminding one of the round preëxisting vesicles. The vesicles are seated on an inflammatory base, and heal up usually in a few days; in some cases they are persistent; in rare cases they become ulcerated, and it is difficult to distinguish them from a chancroid. Uncleanliness and the presence of gonorrheal fluid sometimes irritate the resulting exulcerations of the vesicles and make them persistent. Herpes is inclined to relapse at different intervals, but relapses in women are not so frequent as in men.

Diagnosis.—Herpes progenitalis is easily distinguished if the vesicles are still present. When, however, the vesicles are broken, and an ulceration remains, there may be some difficulty in distinguishing herpes from venereal or syphilitic ulcerations. The superficial character of the lesion, the scanty serous secretion, the peculiar round disposition of the edges, the smoothness of the surface are characteristics enough to show us that we have to do with a case of herpes. Sometimes, however, a hard chancre in its erosive stage has been mistaken for herpes (see Syphilis of the Vulva). In women in whom especially the hardness of the lesion is often not clear we lack one of the most important characteristics for diagnosis. The surface of a chancrous erosion is usually deeper in color, round in shape, with a smooth surface, and is found in places where the herpes does not usually appear, as in the fourchette and in the ostium vaginæ.

With reference to the possible confusion of herpes with chancroid, it is difficult for it to occur when we keep in mind the appearance of the chancroid lesion, which is the most reliable diagnostic by itself. Indeed, the punched-out, round, irregular, or ragged, often undermined ulcer, which rapidly spreads, accompanied with abundant secretion, and exhibiting an unhealthy, diphtheroid, worm-eaten surface, cannot admit of confusion. At any rate, especially in the beginning, when no other diagnostic characteristics are present, in case of doubt it is better to suspend diagnosis, being sure that on the following day the doubt will be dispelled.

Treatment.—As already stated, the use of douches with warm water, having in solution some borate of sodium or any other mild antiseptic, is advised. The general health of the patient must receive its proper care, and the use of mild saline purgatives is advisable when constipation is annoying; alkaline mineral waters when catarrhal conditions of the digestive organs exist; iron tonics and reconstructives when symptoms of anemia and general denutrition are present. Locally the application of a wash containing lead and opium is very useful, especially when the herpetic eruption is accompanied with pain and irritation. Touching the ulcerated surface with a solution of nitrate of silver, from 6 to 8 per cent., has given very satisfactory results. The surface is then covered with an innocent salve, as Wilson's ointment, or with vaselin containing some carbolic or salicylic acid. The application of powders is also used with some benefit. Iodoform is objectionable because of its odor; but aristol and europhen are applied with advantage on the exulcerated surface. The powders have the disadvantage that they form crusts with the secretion, which soil the exulcerated surface. Ravogli prefers the use of powders when the surface is healing, at which time the parts may be dusted with oxid of zinc, subnitrate of bismuth, rice powder, or any other substance capable of keeping the surfaces dry and separated.

The application of camphorated alcohol has been used as an abortive measure, and in the same way Depas, of Lille, advocates the application of compresses of absolute alcohol, to which 2 per cent. of resorcin and 1 per cent. of menthol and carbolic acid are added.

BARTHOLINITIS

(*Mixed Infection*)

Bartholinitis, or infection of the vulvovaginal gland (gland of Bartholin), is generally due, in the first instance, to the *Bacillus gonococcus*, but, when the active stage is reached, the *Staphylococcus pyogenes aureus*, the *Staphylococcus pyogenes albus*, and, more occasionally, the *Streptococcus pyogenes* and the *Bacillus coli communis* are found in the discharges. The presence of the *Bacillus pyocyaneus* has been demonstrated by Rothrock.

(For further consideration of this subject see Gonococcus Infection of the Vulvovaginal Gland.)

MIXED INFECTION OF THE VAGINA

(*Vaginitis*)

The lining membrane of the vagina, having no mucous or other secretory follicles, depends for its moisture upon the secretion derived from the uterine mucosa. When this secretion is permitted to remain unduly long in the vagina the vaginal epithelium becomes softened by maceration, and, when decomposition of the secretion occurs, the chemical and bacterial action in the epithelium is destructive. In this way atria, more or less extensive, are formed through which bacteria, normally present in the vagina, find a new habitat or a new environment, in which they possess pathogenic properties. In this way a deep and persistent infection or inflammation of the vaginal wall may take place, a condition in which, as a result of the deep-seated circulatory disturbance, there is a constant desquamation of the surface epithelium. This condition and the absence of any mucous secretion whatever explain the persistent "buttermilk discharge" characteristic of chronic mixed infection of the vagina or chronic vaginitis.

The circulatory stasis incident to pregnancy or to large intrapelvic tumors often induces a passive hyperemia that aggravates the infection. The involuminal changes of senility—vaginitis senilis—characterized by disappearance of the epithelium, the agglutination of the thus denuded proximal surfaces, and the obliteration of the fornicle, with a reversal of the vaginal pyramid, are ascertained and hastened by mixed infection of the vaginal wall. In certain of these senile cases bridges may form in the upper zone of the vagina, where stenosis of the canal may become either partial or complete.

Emphysematous vaginitis has been described as occurring chiefly in pregnancy, and as being characterized by the formation of numerous minute air vesicles in the submucosa. I have seen one such case. The condition is manifestly due to some acrogenous microorganism which as yet has not been identified.

The bacteria engaged in this process are, for the most part, those normal to the vagina (see Bacteria of the Normal Vagina).

The pathology already briefly indicated shows why the condition is not readily amenable to treatment. I know of no condition more persistent or more obstinate than chronic vaginitis.

Symptoms and Diagnosis.—Mixed infection of the vagina is usually chronic, and in the majority of instances seems to develop without an initial acute stage. It sometimes persists after parturition, and occasionally it is a survival of such pure infections as that by gonococci, streptococci, and the *Bacillus tuberculosis*. In certain neglected cases the margins of the rugæ are red, even excoriated, and may bleed easily when touched. The intervening folds will generally be found to contain a grayish-yellowish discharge, which abounds in epithelium leukocytes and bacteria. These infected areas may become ulcerated. In senile cases marked involution may occur, the surface becoming smooth, glistening, and dry. Ordinarily, however, the parts are bathed with moisture—not secretion—from the vaginal wall and with secretion from the cervical canal. Pain is a variable symptom, depending upon the extent of the inflammation and upon the existence of eroded or ulcerated areas.

Treatment.—The first indication is antisepsis. This can readily be effected so far as the surface is concerned, but is difficult in dealing with deeper seated infection. The vagina should be cleansed twice daily with normal salt solution or with sodium bicarbonate solution. This should be given with care.

118. PROCEDURE FOR CLEANSING THE VAGINA IN MIXED INFECTION (CHRONIC VAGINITIS)

(1) A fountain syringe filled with 2 liters of tepid normal salt or sodium bicarbonate solution is hung as high as possible.

(2) The patient is seated over a commode or slop-jar.

(3) A large spray-tipped tube is inserted into the vagina.

(4) The patient's hand is pressed over the vulva firmly enough to close the orifice of the vagina around the syringe nozzle.

(5) The current is turned on until the vagina is thoroughly dis-

tended, when the hand is removed and the water permitted to come away with a gush.

(6) This should be repeated until all the water is exhausted.

(7) One liter of clear tepid water should then be similarly employed.

(8) If it is desired to use an antiseptic, it should be given in the same way immediately after the vagina has been washed out as indicated by the clear water.

If the pressure is strong enough the distention of the vagina will temporarily obliterate the rugæ, by which means the whole surface becomes exposed to the action of both the detergent and the antiseptic solution.

Douches may be followed with tampons of absorbent cotton saturated with a 5 per cent. solution of ichthyol in glycerin. The ichthyol is antiseptic and the glycerin is exosmotic—both of which actions are helpful in deeply grounded mixed infections. The treatment, to be beneficial, should be continued until any ulcerations are healed and until the "buttermilk" discharge ceases.

The cure is promoted by removing any contributing cause, such, for example, as pelvic pressure, constipation, or intestinal displacement. In senile cases with a tendency to stenosis the fusions must be broken up. This should be done thoroughly under an anesthetic, and the separated surfaces kept apart by distensive tamponade until they have had time enough to become covered with cicatricial tissue.

MIXED INFECTION OF THE UTERUS

(*Endometritis and Metritis*)

Mixed infections of the uterus are those in which various species of pathologic bacteria are carried into the uterus and establish inflammation, the nature of which is not dominated by any particular form of microorganism.

Mixed infection of the uterus may be limited to its lining membrane (endometritis), or it may extend into the muscular layer (metritis), or it may involve the peritoneal layer (perimetritis). Infection of the muscularis probably never occurs independently of a similar infection of either the mucosa or the serosa. Inflammation of the mucosa without involvement of the muscularis is, however, of frequent occurrence. Infection of the serosa is liable to be associated with some involvement of the muscular structure.

In the absence of deep traumatism of the uterus, a condition that but rarely occurs outside the puerperium, the mixed infections become operative primarily in the endometrium, to which their activity is genfrom pathogenic organisms, and the endometrium is always sterile. Pathogenic cocci and other germs which might enter from adjacent cutaneous surfaces perish in the acid vaginal secretions, which are unsuited for their growth. The reaction of the vagina, however, may be altered by the presence of inflammatory products, so that infection may occur through this route.

Conditions modifying infection are also found in the menstruation. The endometrium, responsive to the increased nutrition which comes from the premenstrual afflux of the blood to the pelvis, undergoes a sort of periodical hypertrophy, preceding each onset of the monthly flow (see Normal Menstruation). The exuberant epithelium undergoes a sort of desquamation. Von Kohlden, who has studied the endometrium during and after menstruation, states that immediately after menstruation large gaps are seen in the superficial layer of the epithelium, and that during menstruation the entire epithelial layer is cast off, and that there are infiltration and hemorrhage into the mucosa. This infiltration may extend through two-thirds of the thickness of the latter. The blood clots which are found within the uterus contain desquamated epithelium and glands. No true solution of continuity of the endometrium can be established. Von Kohlden has never been able to find the giant cells described by Leopold, or evidence of dilatation and tortuosity of the glands. The reproduction of epithelium begins *de novo* within the glands, not from islands of cells which were not cast off; there is also a new formation of blood vessels. Lohlein prefers this expression to either "membranous dysmenorrhea" or "exfoliative endometritis," since dysmenorrhea is a prominent symptom in only one-half of the cases, and most observations show that there is no real inflammatory trouble. He believes that the membrane bears more of a resemblance to a product of conception than to that of inflammation.

The muscular layer of the uterus (*myometrium*) consists of bands of decussating fibers arranged in different directions, and in more or less definite concentric layers. Within the meshes of this fibrillation are to be found numerous nutrient vessels, branches of the uterine and ovarian arteries, with their accompanying veins. There are also freely interspersed within the muscularis numerous lymphatic vessels, which in the non-gravid uterus are minute and generally closed, but which during pregnancy and immediately after parturition are greatly enlarged, their orifices communicating directly with the placental site. There are also numerous nerve filaments, derived for the most part from the sacral sympathetics.

The peritoneal covering (serosa) of the uterus is so intimately blended with that it cannot be separated from the muscularis. It is and on section shows cells that have become elongated and arranged in bundles and fasciculi. The changes that are now presented are very much like those observable in the senile uterus. In these cases there is generally diffuse sclerosis of the muscularis.

In a later stage the infected follicles become hypertrophied, causing what is designated as glandular hypertrophic endometritis. The result is essentially one of increased glandular development, with corresponding increase of functional capacity. The glands seem to be increased in size and number and to be studded more closely together than in normal conditions. The exuberance of epithelial cell growth results in an apparent thickening of the endometrium, which now appears to be arranged in slight folds, on the apices of which, more distinctly than elsewhere, the cell development seems to be luxuriant. On section the mucous glands, instead of being straight tubules projecting downward into the stroma, are found to be tortuous, or in other cases to show simple deviation in axis. On cross section their calibers are found to be widened, their lumen being largely occupied by the exuberant cell growth. In this class of cases the lumen of the mucous gland often becomes so distended with newly formed epithelial elements that the latter project from the ostium and appear upon the surface with a sort of granulation. In the more distinctly hyperplastic varieties there seems to be not only an increase in the number of the tissue elements, but a multiplication of the glands themselves. These glands increase in size and number, and sometimes show a marked increase in the interglandular stroma. The exuberant cell growth in these cases results in a thickening of the mucous membrane, the surface of which presents a fungous appearance. It is for this reason that the condition is sometimes called fungous endometritis. As the epithelial cells develop from the matrix, there is demonstrable a certain proliferation of the sanguiniferous capillaries to give them support. The cell growth is, however, so active that it gets beyond the influence of the nutrient supply and undergoes fatty degeneration. When this occurs the terminal filaments of the newly proliferated vessels are exposed, and hemorrhage results.

Among the chief causes of this infection may be mentioned agencies that will carry microorganisms into the previously non-infected uterus. The use of instruments to produce abortion and the employment of the uterine sound for more legitimate purposes may be held responsible for a large number of cases.

The use of an unclean speculum is a reasonable explanation of the infection of the upper portion of the vagina, whence the infection may extend by progressive invasion to the endometrium.

Pessaries, for the most part unclean and stinking things, are to be looked upon with more than suspicion. The use of an unclean syringe nozzle is dangerous. There are certain physical conditions of the uterus that are undoubtedly predisposing causes of infection.

Laceration of the cervix, by exposing a portion of the endocervium to the infectious elements that abound in the vagina, may pave the way for a more general involvement. Schultze has called attention to the influence of a chronic dilatation of the cervix in favoring the introduction of morbific agencies into the uterine cavity. Prolapsus of the uterus, when complete, is generally associated with more or less infection of the endometrium.

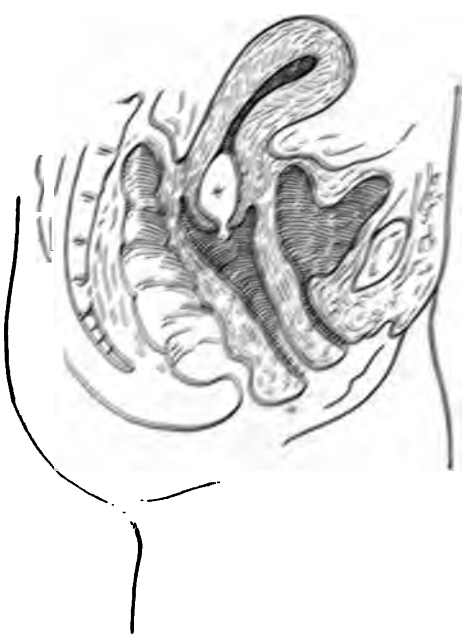


Fig. 279. The Mucous Plug in the Cervical Canal that May be the Cause of Both Obstructive Dysmenorrhea and Sterility.

Uterine displacements in general may be looked upon as contributory influences in producing the pathologic states which are found in patients with associated demonstrable infection.

Neoplasms of the uterus, particularly when they have become the seat of retrogressive changes, are a source of infection.

Acute infectious diseases have been looked upon as causes of endometritis.

Massin, after a careful study of this phase of the subject, concludes that in acute infectious diseases the endometritis undergoes three processes: (1) increased amount of blood to the uterus, venous stasis, and inflammation of the vessels; (2) granular inflammation; (3) diffuse spreading of this inflammation. In our experiments we were unable to ascertain whether microorganisms were present or not. "We must," says Massin, "therefore, consider acute infectious diseases as important factors in the causation of uterine diseases, so that when we consider the etiology of acute and chronic endometritis we must always think of the possibility of the affection being the result of an acute infectious disease."

Symptoms and Diagnosis. When the infection is restricted to the epithelium and to the follicles the secretion of mucus is greatly exaggerated, causing the condition often designated as uterine catarrh, or uterine leukorrhea (Fig. 279). This discharge is generally clear and viscid, and is occasionally stained with blood. It is sometimes of a distinctly mucopurulent character. A smear should always be taken and the bacterial and other elements determined. Schultze, recognizing the fact that purulent elements may be so slight in the uterine discharge as to escape detection, advises the use of a glycerin tampon for diagnostic purposes. The tampon should be removed by the surgeon, who should carefully inspect it and thereby ascertain with accuracy the presence or absence of purulent elements.

In cases of long standing, frequent hemorrhages, occurring either in connection with menstruation or during the intermenstrual period, are to be construed as evidences of fungous degeneration of the endometrium.

There may or may not be dysmenorrhea, and the uterus may or may not be enlarged. The cervix in the majority of cases is, however, the seat of more or less engorgement or infiltration, or may even be edematous. In some cases the uterus may be painful, a condition which Sneguireff of Moscow designates as endometritis dolorosa. Sensibility of this character is generally more marked at the fundus.

The diagnosis should embrace not only the existence of a catarrhal condition, but, if possible, (a) the character of the infection, whether "pure" or "mixed"; (b) the stage of underlying pathologic change; and (c) the associated neoplastic or other contributory conditions.

A careful bacteriological examination should be made in all cases. In taking a specimen of the secretion for this purpose care should be exercised that it contain no bacterial elements from the vagina. It ought, therefore, to be taken from high up in the cervical canal and another from the uterine cavity.

If the endometrium is everted at the cervix and presents a granular appearance the case is one of glandular hypertrophy.

If hemorrhages are present there exists a strong suspicion of endometritis fungosa. It should be remembered, however, that hemorrhage is a conspicuous symptom of various malignant processes, not only of the cervix, but of the corpus uteri (see Symptoms of Malignant Neoplasms of the Uterus). This makes it imperative that the cavity of the uterus be explored by curettage.

119. PROCEDURE FOR EXPLORATORY CURETTAGE IN MIXED INFECTION OF THE UTERUS

(1) The patient, anesthetized, preferably with nitrous-oxid-oxygen, is placed in the recumbent posture with thighs flexed.

(2) The uterus is gently drawn down and a small-sized mechanical

divulsor is gently introduced, the dilatation being carried far enough to admit a small-sized Emmet curette forceps.

(3) This forceps is opened, closed, and withdrawn, the specimen of granular or other tissue that is brought with it being carefully removed for microscopic examination.

(4) This should be repeated several times, the specimens removed being kept separately, note being made of the exact locality from which each is derived.

(5) If granular or other pathologic products are found the cervix should be further dilated and a complete curettage done.

(6) After the curettage, whether exploratory or complete, the uterus should be mopped out thoroughly with 98 per cent. carbolic acid, and immediately thereafter with alcohol.

I have found this procedure entirely satisfactory. Gessner, however, in a careful discussion of the technique of exploratory curettage, states that anesthesia is useful, although not indispensable. The dilatation is to be carried to a degree that will admit of the introduction not only of the curette, but subsequently of an irrigation catheter. A sharp curette is to be employed and the whole interior of the uterus must be carefully scraped and every fragment so removed must be examined under the microscope. Unless this precaution is taken evidence of malignancy, which may be derived from a very limited area, may escape detection. Sänger recommends that the uterine canal be dilated by means of laminaria tents until not only the curette, but also the finger, can be introduced into the uterine cavity. He states that in those affections of the corpus in which malignancy is always to be suspected the use of the curette is superior to simple palpation, but palpation with curettage and microscopic examinations of any débris that may be removed will give more information than the two latter only. While Sänger insists upon this technique in cases of abortion and of myomata of the corpus uteri, he recognizes in digitation a valuable diagnostic expedient in certain enlargements of the uterus associated with involvement of the endometrium. Gessner, in speaking of the diagnostic value of exploratory curettage, states that in the Frauenklinik of the University of Berlin a diagnosis of malignant disease of the corpus uteri had been made and the organ had been extirpated in fifty-eight cases during a few years. In eleven carcinoma could be distinctly felt through the dilated cervix; in three others, in which the finger could reach the new growth, the disease was found to be sarcoma. In forty-one cases, however, the diagnosis was made not by digitation, but by exploratory curettage. He looks upon the latter as the more valuable expedient.

Treatment of Mixed Infection of the Uterus.—The treatment of endometritis, and for that matter of metritis, when the result of mixed infections, resolves itself into (a) general medical and hygienic; (b) topical; and (c) surgical.

The general medical and hygienic treatment is addressed to building up the general health and relieving such contributory causative conditions as constipation, when purely functional, and derangements of the portal circulation. For these latter purposes an initial course of small alterative doses of calomel followed by a saline is highly beneficial. Intestinal antisepsis with tonics effected by a combination of salol with strychnia is indicated when flatulency is present.

Local or topical medication is addressed to destruction of the infection and to the relief of the pathologic changes that it may have induced. As indicated by the discussion of the pathology of this condition, however, there exist such organic changes that any results that may follow the use of local medication must be at best slow and uncertain. It may be stated, as a rule, that intrauterine medication for catarrhal conditions is unsatisfactory. There are patients, however, who prefer to be treated locally for a long time rather than to submit for a few days to anything suggestive of surgical intervention. In these cases treatment should consist in the use of bacteriological agents. These should be so applied that the entire mucous surface should be subjected to their influence; for, if a portion of the mucous surface remains untreated, and consequently infected, it becomes the focus for the reinfection of the entire structure. Another principle of equal importance is that an intrauterine application of a bactericidal character should be repeated or maintained for several days, so that not only the bacteria themselves, but their spores also, will be destroyed.

There is probably nothing in the whole range of gynecological therapeutics that is so futile, not to say farcical, as the repeated applications to the cervical membrane of various medicaments of undetermined antiseptic value, and many of them of unknown ingredients. As a rule, these applications are made to a canal bathed with tenacious mucus, which of itself constitutes an efficient protective for the underlying microorganisms. Topical treatment, to be effective, must be brought into direct contact with the microorganisms. These, as already described, are hidden away within the epithelial folds or deep down in the mucous follicles. The tissues themselves, both epithelial and subepithelial, are more or less hypertrophied; an agent, therefore, which will be effective must modify this histologic state. Most practitioners have, therefore, abandoned the use of non-escharotic agents. Those that are employed, however, are not viciously destructive of the tissues, like nitric acid or sulphuric acid or pure formalin.

120. PROCEDURE FOR THE TOPICAL TREATMENT OF ENDOMETRITIS

(*Mixed Infection*)

(1) The cervical canal is dilated, if necessary, to a very slight degree by means of a Nott or other small dilator.

(2) The posterior lip of the cervix is seized with a volsella or the serrated cervix forceps of Dumont-Lelois, and held by slight downward traction.

(3) The uterine cavity is then packed with a very slender ribbon of dry sterilized gauze.

(4) This is immediately withdrawn, bringing with it all the mucus from the endometrial surface. If a first packing is not satisfactory for this purpose a second may be utilized.

(5) After the mucous surfaces have thus been carefully cleansed the uterine cavity is again packed with a slender ribbon of gauze saturated with 98 per cent. carbolic acid. This is left *in situ*. In applying the carbolic acid it is important to avoid bringing it in contact with the integument of the mucous membrane of the vagina; but, if this accident should happen, the place should be immediately touched with pure alcohol, which will neutralize the carbolic acid.

(6) A tampon of glycerin or of boroglycerid is applied and the patient is permitted to go home, returning in forty-eight hours for a repetition of the treatment. Three or four applications of this kind, made at lengthening intervals during ten days, are generally sufficient to cure an ordinary case of catarrhal endometritis.

(7) After the last application of the carbolic acid an Outerbridge dilator should be inserted and left from two to three weeks for purposes of drainage and to prevent possible stenosis.

The treatment, contrary to usual theoretic preconceptions, is not particularly painful and never requires an anesthetic. The destruction of epithelium from these repeated applications is not sufficient to interfere with its speedy reproduction.

Other methods of topical treatment are in vogue at the hands of different operators. Cases have been reported in which cures have been effected by the introduction into the uterine cavity of a piece of lunar caustic, which was permitted to dissolve *in situ*. The uterine cavity has been packed with boric acid and with iodoform, both of which have some bactericidal properties. Canquoin has reported successes from the intrauterine application of a paste, the essential ingredient of which is the chlorid of zinc. It is prepared in the form of a pencil and is introduced into the uterus; Pichevin, Emmet, Schroeder, Martin, Munde, Jacobs, and others have reported adversely on its use, and it seems to have been discontinued. As an escharotic agent the chlorid of zinc is vastly more destructive than even the silver nitrate, the use of which has been very generally abandoned.

Sneguireff recommended the action of steam upon the inner surface of the uterus as a means of arresting intrauterine hemorrhage, and it has been quite extensively employed, especially in Russia. Its application requires a steam generator with a safety valve and with a central opening for the insertion of a thermometer, the generator being connected by rubber tubing with a metal catheter of necessary length for intrauterine application. The temperature should be kept between 100° and 110° C. (212° to 230° F.). A Fritsch uterine irrigator may be used for the application of the steam. The patient is placed in the lithotomy position and a short cylindrical speculum of some non-conducting material, such as celluloid or hard rubber, or preferably wood, is inserted. A catheter is then inserted and the steam is turned on. The instrument should be encircled with gauze, or provided with a non-conducting handle, to avoid burning the hands of the operator. The patient should remain in bed for a few days. There is generally considerable reaction with pronounced perimetric irritation. It has been recommended by Pincus for senile endometritis with profuse hemorrhage or leukorrhea; where irregular hemorrhages are associated with subinvolution of the uterus; for diffuse myomata; for hyperplastic or catarrhal endometritis; and for gonorrheal and streptococcus infections of the uterus. It must not be used in the presence of diseased adnexa or in cases of stricture of the cervical canal, while it is not advised in polypoid myomata. This method is spoken of as vaporization, but it is really a cauterization with extensive destruction of tissue. It is possible that the principle may survive, although the present technique seems to be defective. The use of superheated steam destroys tissue to a depth that is dangerous. Baruch reports a case of atrophy of the uterus with occlusion of the cervical canal and apparently of the whole uterine cavity, following vaporization in a woman only twenty-seven years old. This condition, amounting to the practical destruction of the uterus, was induced by a single intrauterine application of steam for the purpose of checking puerperal hemorrhage, an object which was speedily accomplished. Von Guerard reports the case of a woman who had persistent hemorrhages following delivery, with evidences of subinvolution of the uterus and fungous degeneration of the endometrium. Atmocausis, as this method of vaporization is called, was employed. There was a cessation of the menses following the operation, but at the menstrual periods unendurable pains were felt, becoming intensified as time went on. The uterine cavity was so obliterated by the steam jet that the sound entered it for about 2 centimeters only. Von Guerard was forced to relieve the patient by total hysterectomy, from which she recovered. In commenting on the case he insists that atmocausis is absolutely contraindicated before the menopause. Schick, of Prague, recognizing the valuable property of heat for antiseptic and hemostatic purposes and as an escharotic agent, has endeavored to secure its desired effect by the use not of superheated steam, but of boiling water. He kept up the irrigation for half a minute, only the vagina and vulva being protected by constant irrigation of ice-cold water. Of the four cases in which he tried it three were successful. While this treatment may be of great value, its employment is certainly associated with great danger, and it is mentioned in this connection only with the hope that the valuable principle which it embodies may find safe exemplification in more refined methods.

The surgical treatment, unless atmocausis just described may be called surgical, is restricted to curettage. It may be stated, as a rule to which there are no exceptions, that in all cases of infection of the uterus, in which the condition has assumed the chronic form with associated histologic changes, the topical application of any medicament, escharotic or otherwise, is less satisfactory than curettage followed by appropriate antiseptic treatment.

For the technique of this procedure see Exploratory Curettage, already presented in this chapter.

MIXED INFECTION OF THE FALLOPIAN TUBES

(*Salpingitis*)

Mixed infection of the Fallopian tubes may be safely considered, for our present purpose, as always the result of secondary invasion following pure infections, more particularly by the gonococcus, streptococcus, and the *B. tuberculosis*.

The symptoms may vary slightly, but the differential diagnosis is without practical importance.

The treatment is identical with that of the pure infection, secondarily to which the mixed infection occurs.

MIXED INFECTION OF THE OVARIES

(*Ovaritis*)

This subject may be dismissed with the identical language just employed with respect to mixed infections of the Fallopian tubes.

MIXED INFECTION OF THE BLADDER

(*Cystitis*)

Cystitis is an inflammation generally confined to the mucous membrane of the bladder, and caused by invasion of the subepithelial structures by pathogenic bacteria.

The urine frequently contains microbes, but this is not in itself sufficient to produce a cystitis. It is absolutely necessary that the microbes lodge and develop either upon or within the walls of this organ before an inflammatory condition can be established.

The causes of cystitis may, therefore, be considered under two heads:

(1) Those influences that predispose to the lodgment and development of the microbes.

(2) The manner in which the microbes gain entrance to the bladder.

(1) One of the most frequent predisposing causes of infection is congestion. This greatly reduces the resisting power of the bladder and may be induced in a variety of ways. Common among these may be mentioned exposure to cold; overdistention of the bladder from prolonged retention of the urine; obstruction to the free escape of the urine due to stricture of the urethra; intravesical tumors, uterine displacements, cystocele, etc.; traumata, such as contusion of the bladder or prolonged pressure from the child's head during labor; contusion from external violence or accidental or unavoidable injury by the surgeon during operations on neighboring parts; internal trauma produced by foreign bodies, either developed within (vesical calculi) or introduced by the patient from without (hairpins, pieces of pencils, chewing-gum, etc.), or by the physician or nurse (catheter, sound, cystoscope, etc.); abnormal states of the urine due to the elimination of irritating substances introduced from without (cantharides, turpentine, oil of sabine, etc.), or developed within the body (toxins from intestinal disturbances, acute infectious diseases, etc.). The bladder participates somewhat in the general congestion of the pelvic organs accompanying menstruation, and this congestion may be greatly increased by sudden suppression of this function.

(2) The second essential factor in the production of the inflammation, namely, the pathogenic microbes, may gain entrance to the bladder (a) through the urethra, (b) from the kidneys with the urine, (c) from the contiguous parts, (d) from the blood. The most common women makes it much easier for microbes to enter the bladder through route is undoubtedly along the urethra. The shortness of this canal in

it in them than in men. Gonorrheal infection, which always affects the urethra, may extend to the bladder. Infections from other microbes involving the vulva, vestibule, or vulvovaginal glands may likewise extend along the urethra. The germs may be carried to the bladder on septic catheters or other instruments. Even a sterilized catheter may carry germs that are within or about the meatus into the bladder. The bruised and congested condition of the bladder following confinement or operations on the generative organs makes the introduction of germs by the catheter particularly liable to excite a cystitis. The greatest care should, therefore, always be taken in cleansing the meatus and adjoining parts, and in sterilizing and introducing the catheter under these conditions. The patient herself may introduce the germs on all sorts of foreign bodies used for masturbating purposes, or when mentally deranged. Germs frequently reach the bladder by descending with the urine from the kidneys. It is not necessary that the kidneys be diseased, as it is well known that these organs frequently eliminate microbes from the blood without themselves being involved thereby. This may take place in the acute infectious diseases, in diseases of the intestinal tract, and in suppurative conditions in other portions of the body. The kidneys, however, may be the primary point of infection, as in pyelitis, nephropyelitis, etc., and this is particularly common in tuberculous infection. The transmission of microbes to the bladder by contiguity may occur in intrapelvic suppurative peritonitis, infections of the uterus, etc. Such purulent collections may rupture into the bladder, thus carrying infection directly. Infection may come from the rectum, from a loop of inflamed bowel that has become adherent to the bladder, or even from the appendix, as Harris has seen in one case. The introduction of germs by direct trauma, as in bullet wounds, punctured wounds, etc., is possible, but not common. Lastly may be mentioned pure hematogenous infections, where germs reach the bladder wall through the blood, as either minute septic emboli or floating germs. The normal bladder possesses considerable immunity to infection. Therefore, in addition to the germs, which are the essential element of inflammation, certain of the above-mentioned predisposing conditions must be present to temporarily reduce the resisting power of the tissues in order that the germs may lodge and develop and cystitis be produced.

To the investigations of Bumm, Clado, Halle and Albarran, Krogius, Escherich, Posner, Lewin, Melchoir, Rovsing, and others is due our knowledge of the bacteriology of cystitis. Many varieties of bacteria have been found in the bladder. The one most frequently present is the colon bacillus. It reaches the bladder usually from the kidneys with the urine, but may pass directly from the bowel to the bladder, when these two organs are connected by inflammatory exudate or adhesions. It may also enter through the urethra. This is most common in very young girls, where, in the presence of acute intestinal disturbances from lack of cleanliness, a vulvar inflammation develops, and the infection extends along the urethra to the bladder. As the colon bacillus does not decompose urea the urine remains acid in colon cystitis. The gonococcus almost always enters the bladder through the urethra. This may occur during an acute gonorrhea or during one of the frequent slight exacerbations of a chronic or latent infection. Many of the cases of cystitis following childbirth originate in the latter manner, favored by the bruised condition of the bladder and urethra incident to the labor. The gonococcus likewise does not decompose urea. Of the ordinary pyogenic microbes the streptococci are more frequently found than the staphylococci. They may reach the bladder on unsterilized instruments or from contiguous suppurating foci, and are frequently found associated with tumors of the bladder, as the epitheliomata, papillomata, etc. The streptococci do not decompose urea, but almost all the staphylococci do. Therefore, in the presence of the latter we find ammoniacal alkaline urine. The proteus of Hauser has been found a number of times in cystitis. It acts very energetically on urea and the urine is, therefore, strongly ammoniacal. The prognosis in infection by the proteus of Hauser is unfavorable, as 3 out of 4 subjects seen by Melchoir died. Krogius saw 2 subjects, both of whom died. The tubercle bacillus is a common cause of chronic cystitis, and usually infects the bladder from a tuberculous focus in the kidney. The urine in tuberculous cystitis remains acid. Other bacteria have occasionally been found in cystitis, but not with sufficient frequency to demand special mention. Mixed infections may likewise occur.

The pathologic changes produced are much the same, regardless of the particular kind of microbe present, with the exception of the tubercle bacillus, which alone produces somewhat characteristic changes. Marked differences, however, exist in degree. The same variety of microbe may at one time produce the most extensive changes, and at another time almost none, for reasons that can not better be expressed than by the terms "varying virulence" on the part of the microbes and "power of resistance" on the part of the bladder. The changes produced are hyperemia with swelling and infiltration. These may be circumscribed or diffuse. In the former case they may be limited to a small area about the inner orifice of the urethra, to the trigone, or to a small area about one or the other ureteral orifice. In severe cases the mucosa is considerably swollen and thrown into folds. It is soft, often edematous, and small hemorrhages are not infrequent. Erosions may occur, particularly on the folds. Papillomatous elevations which are soft and bleed easily on touch may form. Inflamed areas may become covered by a grayish or yellowish membrane-like substance composed of pus cells, mucus, bacteria, detached epithelial cells, etc., in which phosphates may be deposited, and which may adhere quite intimately to the mucosa. The changes may extend to the submucosa and muscularis, where abscesses may form that may rupture into the bladder or into the pericystic tissues. The inflammatory changes may extend through the entire wall of the bladder, producing a pericystitis. In chronic cases the muscularis becomes greatly hypertrophied, the walls much thickened, and the capacity of the organ markedly reduced. In a particularly virulent infection following childbirth or some of the acute infectious diseases the mucosa may slough. A diphtheritic cystitis may likewise occur. In tuberculous cystitis the changes are usually circumscribed and appear first about the ureteral orifices. Small, slightly elevated tubercles may be seen which undergo caseation and softening, and break down, forming small ulcers. There may be but a single ulcer or they may be multiple.

The pathology, symptoms and diagnosis, and treatment of cystitis from mixed infection have been adequately presented under the head of the pure infections, e. g., gonorrheal, streptococcus, and tuberculous, to which the reader is referred for detailed presentation of these subjects.

MIXED INFECTION OF THE KIDNEY

(*Nephritis*)

Mixed infections of the kidney may be restricted to the pelvis of that organ (pyelitis), or it may involve both the pelvis and parenchyma (pyelonephritis), or it may result in suppuration of the kidney substance (pyonephrosis), or it may invade the tissues surrounding the kidneys (perinephritis and perinephritic abscess). These forms will be here considered collectively.

The cause of these various inflammatory and suppurative changes, when not due to pure infections, is to be found in multiple or mixed infections. In the majority of all cases the mixed infections are secondary to a pure infection, which dominates both the ensuing pathologic changes and clinical manifestations. Any of the pus-producing organisms may be present; staphylococci, streptococci, *Proteus vulgaris*, and *Bacillus pyocaneus* are among the chief infectious elements. Guiteras calls attention to the fact that the *Bacillus tuberculosis* and the gonococcus, often present in these cases, are not considered pus-producers, but prepare the way for pus formation by secondary invaders.

The mixed infection may reach the kidneys through either the blood or lymph channels, or by contiguity of surfaces.

Certain contributory causes are to be taken into account. Aside from the special infections traumatism of the kidney, calculi, new growths, and obstructions to the urinary outlet are frequent etiologic factors. Bad dietetic habits, especially the consumption of large quantities of alcohol, result in functional overactivity of the kidneys, and tend to lower their resistance to infection.

The invasion, when not secondary to a pure infection, generally begins with a simple catarrhal condition of the pelvis of the kidney. As the process advances the usual phenomena of stasis and exudation with swelling of the membrane take place. This engorgement is sometimes sufficient to close the renal ostium of the ureter, with the consequent retention of urine and distention of the cavity by the urine. The infection, if it has not already invaded the parenchyma, is now speedily extended to it, and a pyelonephritis, or possibly a pyonephrosis, develops. The kidney enlarges. The tubules and glomeruli become involved with loss of their endothelium (casts). Foci of intense engorgement may become suppurative. These multiple abscesses, varying in size from a pea to a walnut, may increase until they coalesce or break into the pelvis (pyonephrosis). The suppurative disintegration of the parenchyma may progress until practically the whole kidney is broken down. The infectious pus thus formed may find its way, apparently by osmosis, through the unruptured capsule. In other cases the distended capsule ruptures. In either event infection with resulting suppuration of the perinephric tissues ensues (perinephritic abscess). These conditions may mark successive stages of the same case. It is known, however, that pyelitis may exist without serious involvement of the parenchyma, and it has been alleged that suppurative parenchymatous nephritis may exist as the initial lesion. Perinephritic abscesses are known to occur without serious involvement of the kidney itself. When this is true they are secondary to some remote focus of infection rather than to that in the kidney.

Symptoms and Diagnosis.—When the infection is restricted to the pelvis of the kidney, and when there are no complications, such as stone, neoplasm, or displacement, the condition may be symptomless. In some cases there is increased volume of urine with increased frequency of urination. Hematuria is rare. Pyuria is frequent in advanced cases, but pus can be found in the centrifuged specimen, even in the early stages. There is practically no disturbance of temperature or pulse. Pain may be absent, but if there is obstruction it may be intense, and always of the colicky character. There may or may not be albumin in the urine at this time, but it speedily appears with an extension of the process to the parenchyma. Then, too, there is a tendency to aggravation of all previous symptoms, especially the renal pain. The temperature begins to crawl up—99° to 100° F. As soon as suppuration occurs, however, and especially if there is ureteral obstruction, the pain becomes intense; the patient has fugitive chills, the pulse becomes more rapid, and the temperature may mount to 105° or 106° F., followed by dropping to subnormal with copious sweats. As the suppuration advances the pain grows less, particularly if there is ureteral drainage. The constitutional symptoms, too, grow less profound, the clinical picture presented at this time being rather that of chronic sepsis. As soon as the parenchyma is sufficiently disintegrated to break down its power of physical resistance the whole organ with its capsule rapidly undergoes distention, becoming converted into a huge sac of pus. At this time the pain is reduced to a minimum, the constitutional symptoms are less severe, although there is a marked recrudescence when there is interference with the ureteral drainage.

In the early or pyelitic stage of mixed infection the kidney is but slightly tender on palpation, and there is no appreciable enlargement. In the latter stages, however, enlargement varies from slight to marked, and tenderness on pressure is most marked in the stage of pyelonephritis. In pyonephrosis the kidney may become very large without becoming correspondingly tender. In perinephritic abscess there is marked tumefaction, with tenderness on touch and with probable redness of the surface. The mass in these cases is immovable.

The urine in mild chronic cases is of low specific gravity, increased in volume, and contains pus, albumin, pelvic epithelia, blood corpuscles, and some casts, both hyalin and granular. The bacterial examination conforms to the conditions already described. When the infection extends to the parenchyma the urine becomes turbid, yellow, or amber. Urea and chlorids are lessened. Seroalbumin and nucleoalbumin are present. The specific gravity, usually under normal, may go as high as 1.025.

Any of the conditions named may cause or be associated with infection of the bladder (cystitis), which may be a source of some confusion in diagnosis. The question of obstruction due to displacement naturally arises in cases of movable kidney. The point is settled either the persistence or disappearance of symptoms after replacement. Neoplasm of the kidney is best excluded by cystoscopic examination and, if necessary, by catheterization of the ureters. An X-ray examination will generally clear up the question of stone. If the pelvis the kidney is injected with either a bismuth mixture or an argy solution the extent of the disease may be fairly outlined by radiographic examination.

Treatment.—The treatment of these cases resolves itself into (a) hygienic and dietetic, (b) medicinal, and (c) surgical.

(a) Hygienic treatment consists in rest, warm baths, and the drinking of abundant water. Guiteras advises that, in suspected mild pyelitis, copious quantities of water, two liters or more daily, should be taken even before steps are taken for a positive diagnosis. Often early cases will clear up under this simple treatment.

The diet should be largely vegetable and free from condiments. The use of alcoholic drinks, especially of malt liquors, should be rigorously interdicted.

(b) Medicinal treatment, internal, should be confined chiefly to the administration of urinary antiseptics. Salol, 5-8 grains, benzoate of soda, 15 grains, or urotropin, 10 grains, may be given advantageously with the water treatment.

Lavage of the pelvis of the kidney by urethral catheterization has been extensively practiced (see Catheterization of the Ureters under Methods of Examination and Treatment). After washing out the pelvis of the kidney by this means any of the following solutions may be thrown in: silver nitrate, 1:4,000 to 1:2,000 or less; protargol, 1.5 or 2:100; argyrol, 10 up to 25:100. Guiteras has used this treatment on several thousand cases in his clinic for nine years, but is not highly impressed with its efficiency. In later cases, i. e., pyelonephritis and pyonephrosis, it is not available.

(c) Surgical treatment is addressed primarily to the removal of causative conditions and secondarily to the removal or correction of acquired pathologic states.

Under the first heading obstructive conditions in the urinary tract, if any exist, should be overcome. This is not a frequent condition in women, who, however, are far from being free from strictures of the urethra and from the free and complete voidance of urine, as a result of such conditions as intrapelvic pressure and cystocele. Provocative neoplasms and stone, if factors in the case, should be removed.

Under the second heading, when hygienic or medicinal resources have failed, or obviously must fail, the pelvis of the kidney should be surgically explored. My method of exploration is as follows:

121. PROCEDURE FOR SURGICAL EXPLORATION OF THE KIDNEY (PYELOTOMY)

(1) Expose the kidney by one or the other of the procedures already described.

(2) Deliver the kidney with its capsule intact through the operation wound.

(3) Carefully pack the operation wound with protective gauze.

(4) Turn the kidney to one side and expose the pelvis.

(5) If the contents of the kidney are fluid or semifluid empty it, as far as possible, with a trocar, introduced about 5 mm. from the juncture of the pelvis with the body of the kidney.

(6) After the contents have been piped off enlarge the puncture enough to admit the introduction of a finger (Fig. 280).

(7) If a stone or a removable neoplasm is found, and if either is obviously the cause of the trouble, remove it.

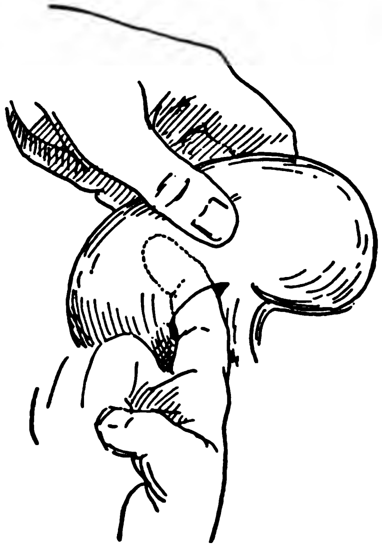


FIG. 280.—(121) PROCEDURE FOR EXPLORATION OF THE PELVIS OF THE KIDNEY. (a) The pelvis of the kidney opened on the side and the finger inserted.

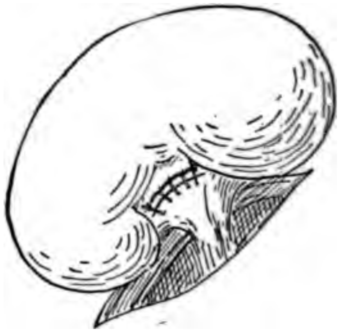


FIG. 281.—(121) PROCEDURE FOR EXPLORATION OF THE PELVIS OF THE KIDNEY. (b) The opening in the pelvis of the kidney is closed by continuous hemostatic and urostatic suture.

(8) Cleanse the cavity thoroughly with hydrogen dioxid, then with normal salt solution.

(9) Stitch up the pelvis with buttonhole suture (Fig. 281) and replace the kidney, relying on the ureter for drainage for the kidney itself. A few strands of silkworm gut should be left deep in the operation wound.

121a. GUITERAS PROCEDURE FOR EXPLORATION OF THE KIDNEY (PYELOTOMY)

(1) The kidney is delivered and pushed over the upper border of the incision in such a way as to put the pelvis on the stretch.

(2) The incision is made from near its junction of the pelvis with the kidney longitudinally toward the ureter (Fig. 282), large enough to allow the end of the forefinger to enter.

(3) The cavity of the kidney is explored with the finger tip carried into different calices.

(4) After the suture has served its purpose it is closed with a Lembert suture.

Care must be taken not to cut through both walls of the pelvis while it is on the stretch.

In certain cases the internal condition of the kidney is such that drainage by the ureter cannot be relied upon and external drainage must be established, which I do in the following way:

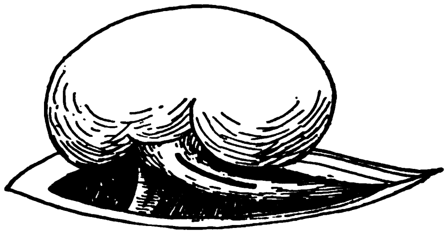


FIG. 282.—(121a) GUITERAS PROCEDURE FOR INTERNAL EXPLORATION OF THE KIDNEY. Linear incision in the ureter.

121b. PROCEDURE FOR EXTERNAL DRAINAGE OF THE KIDNEY (NEPHROSTOMY)

(1) Expose and explore the kidney by either of the procedures just described.

(2) If the disintegration of the kidney substance is such as to require external drainage, and not sufficient to justify complete removal of the organ, incise the capsule on the cervix edge of the kidney, near the lower pole, for a distance of about 1 cm., taking care not to invade the parenchyma.

(3) Thread a needle, load it with a piece of silver wire, and pass it through the parenchyma of the kidney, from the pelvis outward, making it emerge at one end of the incision in the capsule (Fig. 283).

(4) By a seesaw motion of the wire cut the kidney substance for a distance of about 1 cm., or to the end of the opening in the capsule.

(5) Insert a mushroom-tipped catheter with its little end through the pelvis, out through the capsule, leaving the tip, with numerous perforations, in the pelvis (Fig. 284).

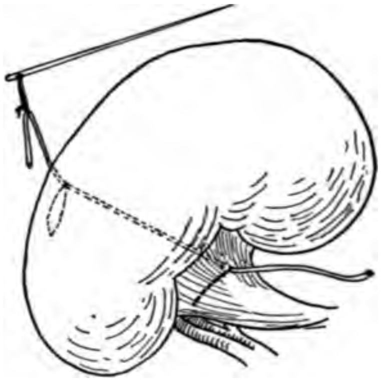


FIG. 283.—(121b) PROCEDURE FOR EXTERNAL DRAINAGE OF THE KIDNEY BY NEPHROSTOMY. (a) The wire has been inserted through the opening in the pelvis and brought out at the convex surface, preparatory to using for cutting the opening for the tube.

(6) Close the opening in the wall of the pelvis (Fig. 284).

(7) Drop the kidney back into its normal position and close the parietal wound, leaving about 2 cm. for the accommodation of the drainage tube.

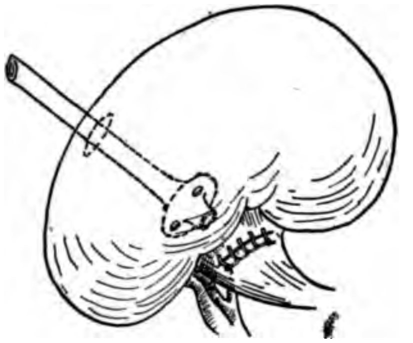


Fig. 284.—(121b) Procedure for External Drainage of the Kidney by Nephrostomy. (b) The opening in the pelvis has been closed and a mushroom-tipped catheter has been inserted for drainage.

The patient should be put to bed, on the railing of which a bottle is hung as a receptacle for the urine. In the absence of any better device this suspension can be readily done by means of two strips of adhesive plaster (Fig. 285).

The kidney should be washed out daily with about 100 c. c. of normal salt solution injected at a time, and permitted to run out. This should be repeated several times at a sitting. By this means the tube can be kept clean and be retained from 8 to 10 days. It should be taken out sooner if the purulent character has disappeared from the discharge; if not a simple drainage tube can be inserted for a few days longer. If ureteral drainage has become reëstablished the fistula will close spontaneously.

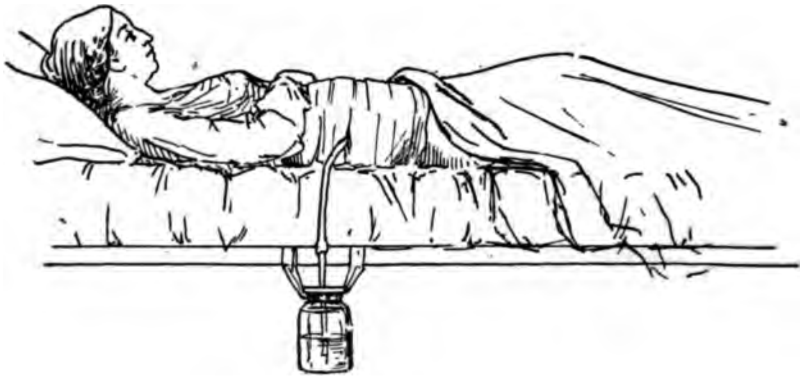


Fig. 285.—(121a) Procedure for External Drainage of the Kidney by Nephrostomy. (c) Operation of drainage tube and arrangement of receptacle.

Perinephritic abscess is treated by lumbar incision and drainage. In cases in which practically all or a majority of the kidney tissue has been destroyed, or in which for any reason it is evident that the function of the kidney cannot be restored, it ought to be removed (see Procedure for Extirpation of the Kidney (Nephrectomy) under Rupture of the Kidney).

MIXED INFECTION OF THE BREAST

(*Mastitis*)

Mixed infection of the breast incidental to lactation might with propriety be spoken of in the early stages as a pure infection. This arises from the fact that its character and course will at first generally be controlled by staphylococci. Secondary invaders, however, speedily make their appearance and modify the type of the infection.

The inflammation is due to the *S. pyogenes albus* and the *S. pyogenes aureus* in the subepithelial structures of the breast. It is a condition generally associated with lactation, rarely occurring under other circumstances. Epithelial abrasions about the nipple, induced by nursing, are generally the atria for the introduction of the pyogenic bacteria. It is for this reason that some authors speak of this particular infection as *lactation mastitis*. The invasion may, however, come from the other side, due to primary infection of the thoracic wall, as from a necrotic rib or an empyema.

Diagnosis.—Staphylococcus infection is not to be confused with the condition ordinarily spoken of as "caked breast," which is generally due to the accumulation of milk associated with extraordinary epithelial activity in the acini of one or more lobules of the gland. These indurations, evanescent and tending to spontaneous recovery as they do, are generally suggestive of localized passive congestions rather than true inflammatory engorgements. On the other hand, staphylococcus or later mixed infection is acute in onset, rapidly progressive in severity, and is characterized by both local and constitutional symptoms indicative of the pathologic process. Generally preceded by cracked nipple, this infection is at first distinctly local, the involved focus presenting the characteristic symptoms of localized heat, pain, redness, and swelling. It is tender to the touch and excessively painful if the breast is sucked either by the baby or a pump. The onset may be characterized by a chill, which is speedily followed by fever, that soon defines a septic curve. Leukocytosis is a symptom that develops early and increases rapidly until pressure is relieved by incision of the foci of suppuration. These foci may be single or multiple, and may involve one or both breasts. In certain cases the focus of suppuration is in the submammary lymphatics, when the process may be masked for sev-

[illegible] hyperemia [illegible] zation of the pre- [illegible] of local passive [illegible] principle involved in [illegible] as being incon- [illegible] which becomes of first importance [illegible]. The preceding treatment is predicated exclusively upon the fact that centers of suppuration cannot be localized. When such centers of suppuration can be detected, however early or however late, and the earlier the better, the time has arrived for *surgical treatment*. This consists in a free incision of the abscess. In making this incision the edge of the knife should always be directed toward the nipple.

In this way the danger of dividing a milk duct, and thus inducing a galactocele, is minimized. A drainage tube should be inserted and kept in as long as the discharge is purulent. While drainage is in progress hot bichlorid poultices, consisting of fluffy gauze wrung out of hot bichlorid solution, 1-4,000, should be applied.

CHAPTER XV

PARASITIC INFECTIONS OF THE FEMALE GENERATIVE ORGANS

TRICHOPHYTON-TONSURANS INFECTION

Trichophyton-tonsurans infection is caused by the vegetable parasite of that name, and is ordinarily spoken of as eczema marginatum. On account of the condition of the skin, which is often macerated by the perspiration, the affection has so peculiar an appearance that for a long time it has been discussed whether it was the result of the same parasite, and for this reason Hebra called it eczema marginatum. At present it is accepted that this affection is nothing else than an ordinary ringworm, modified in its appearance by the locality. The moist condition of the epidermis allows the parasite to grow with more vigor, and the increased inflammation gives the different appearance to the affection. It is an affection found not only on the genitals, but wherever two surfaces of the skin are close to each other. In this way we find eczema marginatum of the axilla, of the breast, and of the crurogenital fold.

It is usually seen when fully developed. It appears as a reddish, [illegible] area circumscribed by a red, somewhat raised, border, [illegible] an arc of a circle. The border is formed by small [illegible] covered with brownish-yellow crusts. The surface [illegible] as a consequence of scratching on account of the [illegible] accompanying this affection. The rings do not re[illegible] sometimes, when the disease is [illegible] to reach the anal region and spread [illegible]

[illegible] the presence of the *Trichophyton* [illegible] but with some patience and [illegible] an appearance like that of [illegible]

[illegible] remedy. Ravogli directs the [illegible] soap, and, after washing and drying, [illegible] layer of Wilkinson's ointment, of which we have already given the formula. Bulkley recommends the use of sulphurous acid, applied in the form of compresses on the surface. Many other remedies are used in trichophyton, such as chrysarobin or betanaphthol, in the form of salves, which can also be applied with good results.

The affection is easily manageable, and after six or eight applications of Wilkinson's ointment, continued until the epidermis exfoliates, we are sure of the success of our treatment.

PHTHIRIUS-INGUINALIS INFECTION

Phthirius-inguinalis infection is caused by the pediculus of that name, and is ordinarily spoken of as *pediculosis pubis*. Although the hairs of the pubes are the ordinary habitat of this insect, yet it may also find its way to the hair of the axillæ, and in the man to the beard. This insect has a peculiar shape, resembling the form of a crab, and for this reason it has been called crab louse, and vulgarly crabs. It hangs to the shaft of the hair, inserting its proboscis into the follicle so as to obtain its nourishment from the sebaceous glands. To the naked eye it looks like a yellowish scale or a little crust. It causes a great deal of itching sensation, but this is seldom so severe as to cause deep excoriation, as in the case of the body louse. It always comes by contagion; sexual intercourse is the most common way of transmission of this insect, but it can be taken also from clothing, bedding, and from contact with the seat board of a public water closet.

This insect is very inactive; it hangs fast to the hair and to the skin, so that it is difficult to detach it. With its powerful claws it holds firmly to the hair, so that in attempting to remove it it slides for some distance before loosening its hold. The eggs of this louse are small and adhere to the hair. A close inspection of the part affected will reveal the presence of the insect and of the nits.

Treatment.—The old application of mercurial ointment is still to be recommended; one or two applications are sufficient to destroy the insect and the nits. This application, however, is somewhat dirty and may produce irritation and dermatitis. The ointment of white precipitate is also recommended. In his clinic Ravogli finds that coal oil gives good results; two applications are enough to kill the insects and nits. Oleate of mercury has also a good effect. After any one of these applications the parts should be kept rigorously clean, and the medicament reapplied two or three times after intervals varying from twenty-four to forty-eight hours.

DISTOMA-HEMATOBIUM INFECTION

Distoma-hematobium infection, or bilharzia, is a condition of rather frequent occurrence among the lower classes of Egypt and more equatorial Africa. The organism belongs to the genus of distomatous parasites (Cobbold), and is a cylindrical worm of the order Trematoda. The male is about half an inch long and the female is a little longer and more slender. In women the primary seat of infection is generally the vulva, whence it extends up the vagina and invades the system, where it is generally found in the portal vessels, and in the veins of the mesentery, and of the urinary tract, causing profound constitutional disturbances, hematuria, anemia, and diarrhea being among the more prominent symptoms. This parasite generally affects men who work in water, and in the majority of cases produces serious local disturbances in the mucous membrane of the bladder, where it causes single or grouped excrescences, not unlike condylomata, with or without pedicles, and varying both in shape and size. The mucous membrane is thickened, and the submucous connective tissue is hypertrophied; the capillaries are dilated, in some instances being changed into cavities which contain full-grown specimens of the distoma. In the interior of these excrescences numerous ova are found. It is not surprising that an organism which is found in the urinary tract of men should find its way into the vagina; and infections of that canal by this parasite are of occasional occurrence. The mucous membrane becomes greatly hypertrophied, owing to papillomatous developments, the excrescences on the interior of the vagina being numerous and flat-topped, and divided by distinct depression, while occasionally one of them may become large and pedunculated.

Treatment.—The treatment consists in excising the excrescences, cauterizing their base, and treating the wounded surface with bichlorid douches. It may be necessary, in removing the larger growths, to incise the mucous membrane so deeply as to render essential the closure of the wound by sutures.

FILARIA SANGUINIS HOMINIS INFECTION

Filaria sanguinis hominis infection is better known under the name of *Elephantiasis arabum*. It is caused by the presence in the blood of embryonic forms of the *Filaria sanguinis hominis*. Embryonic forms of this parasite infect the pudendal organs, obstruct the lymph channels, and result in marked hypertrophy. This hypertrophy may involve either the labia minora, the labia majora, the prepuce, or the clitoris, or all of them. In the negro and negroid races the disease is comfined chiefly to the labia minora, which attain such dimensions that they occasionally extend nearly to the knees. This form of hypertrophy is prone to much greater development than that due to other causes (see Hypertrophy of the Vulva).

The *presumptive diagnosis* is based upon the hypertrophy; the *positive diagnosis* is based upon a demonstration of the filaria in the blood and in the tissues.

Treatment.—The general treatment is that for filariasis; the local treatment is surgical and consists in excision of the hypertrophied parts.

ECHINOCOCCUS INFECTION

Echinococcus infection, while not of common occurrence, probably exists with greater frequency than is indicated by the records. The demonstration of hooklets in many so-called "hydatid moles" of the uterus is an indication of parasitic origin of at least an important number of these cases. It would seem as if a more careful investigation of these intrauterine products would tend to eliminate pregnancy as an essential element in their production, and to restrict their etiology within the category of infections. That echinococci may, however, attack the decidual structures of a recent pregnancy is beyond doubt. These organisms may also invade the muscularis of the uterus. When the parenchyma is the primary locus of infection the resulting parent cyst may develop, as does a myoma, either beneath the mucous membrane or beneath the peritoneum. One of the earliest cases on record —i. e., MacNeven's (1849)—was an example of submucous development, while a more recent case by Altormyan is a distinct example of subperitoneal development of the cyst. The same may be said of the case reported by Freund and Chadwick.

Symptoms and Diagnosis.—The symptoms of echinococcus infection of the uterus are not essentially pathognomonic. There is tumefaction in the uterine region; a sense of weight, that may run through several months or years; cessation or irregularity of menstruation; increasing pressure on the bladder and bowels; while there usually occurs a progressive decline of general health. The tumefaction, which is ordinarily median at its commencement, may develop either to one side or the other, according as the tumor grows either to the right or to the left. The tumor itself, in a case of parenchymatous infection, is generally described as smooth and elastic. When it presents in the uterine cavity or at the cervical margin it is generally fluctuating at the presenting point, although the palpation wave is transmitted but indistinctly to remoter parts of the growth. In the uterine cavity the cyst may present many features in common with the amniotic sac,

ACTINOMYCOSIS INFECTION

This condition has been observed by *Zemann*, the lumen of the Fallopian tube being filled with pus in which the parasite abounded. The microorganism (*streptothrix actinomyces*) attacked the walls of the tubes, which were thickened and granular. The origin of the infection was not determined.

iodoform gauze. Drainage should be maintained until the cavity is thoroughly collapsed. If, however, the disease shows a tendency to progressive invasion of neighboring structures hysterectomy should be performed. When the infection is restricted to the uterine cavity the expulsion of the cystic product generally results in the immediate recovery of the patient. It is well known that the echinococcus disease may attack any organ in the body, and it seems, according to W. A. Freund, Wiener, and others, that the broad ligament constitutes no exception. It is asserted (Pozzi) that the echinococci "travel about in all the cellular interstices communicating with the superior pelvirectal space, which seems to be their point of entrance, and may thus reach the broad ligament, pass into the iliac fossa, and out of the pelvis either below or above the crural arch." Freund reported 18 cases of echinococcus within the pelvis to the gynecological section of the Fifty-first Meeting of German Naturalists and Physicians at Baden, 1880. In 10 of the cases the diagnosis was proved by section, and in the rest by puncture and operation respectively. It was Freund, too, who determined the site of the echinococcus in the pelvis, the road it travels, how it grows, its relations to the intestines, its spontaneous existence if left to itself, how to make the diagnosis, and the treatment to be pursued. In addition to the symptoms of the presence of a pelvic tumor or tumors we shall have the symptoms characteristic of echinococcus; if the patient's health is good, as it often is, vocation, association with dogs (especially shepherd dogs), and country will aid us in our diagnosis. The hydatids often cause inflammation of the pelvic organs and adhesions between them. The cysts which form vary considerably in size; some may grow so large as to demand removal through the abdominal wall. When the inflammation is extensive the disease may be mistaken for cancer. The cysts are filled, as a rule, with a clear fluid, non-albuminous in character, and containing chlorids and sometimes traces of sugar (Osler). Suppuration may occur, especially when hooklets are found; when they are absent it is believed that the fluid is sterile and the cyst becomes harmless.

Medical *treatment* of these cases is not very satisfactory. The cysts, if they become troublesome, may be attacked through the vagina, perineum, juxtasacral region, or the abdominal wall. All will depend upon the location and size of the cyst. The sac may be completely enucleated or stitched to the wound and then drained. Freund (Pozzi) says: "If we have to cut through the peritoneum we must, so soon as we reach the sac and before opening it, use a tamponade of iodoform gauze for twenty-four to forty-eight hours, in order to assure hematemesis, and the formation of protective adhesions; at a second séance we can open the sac under antiseptic precautions."

ACTINOMYCOSIS INFECTION

This condition has been observed by Zemann, the lumen of Fallopian tube being filled with pus in which the parasite abou The microorganism (*Streptothrix actinomyces*) attacked the wa the tubes, which were thickened and granular. The origin of t fection was not determined.

SECTION VI

NEOPLASMS

CHAPTER I

MYOMATA OF THE FEMALE GENITOURINARY ORGANS

Myomata are variously and interchangeably designated as myomata, fibromata, fibromyomata, and fibroids.

They may develop from any fibrous stroma. In gynecologic practice they occur (a) on the vulva, (b) in the vagina, (c) the uterus, (d) ovaries, (e) kidneys, and (f) the intestines.

PATHOLOGY OF MYOMATA

PATHOLOGY OF MYOMATA OF THE VULVA

Among the benign true tumors of the vulva, myomata, fibromata, and fibromyomata are probably the most common, though they are by no means frequently met with. These new growths take their origin from the subcutaneous connective tissue of the labia majora and labia minora, more rarely from the clitoris.

Myomata of the vulva form hard, somewhat nodular, roundish, oval, or elongated masses, covered by normal skin.

Histologically these tumors consist of newly formed, wavy, fibrous connective tissue, very poor in nuclei, which is surrounded by a capsule made up of a condensed tissue of the same type. The skin is generally somewhat movable over the capsule, and is not much changed in its structure and appearance. The tumor proper frequently contains, besides fibrous connective tissue, non-striated involuntary muscle fibers or cells, so that the neoplasm assumes the character of a fibromyoma.

Pure myomata of the vulva are very rare, though they have been observed occasionally. While the tumors of the fibromyomatous group are, as a rule, firm, hard, and solid, there may occur in them, in consequence of lymph stasis, lymphangiectatic spaces of large extent. In a case of this kind diagnosis between fibromyoma and elephantiasis may be impossible without the aid of a microscopic examination. The latter, however, will clear up the diagnosis. The fibromata show a well-circumscribed proliferation and new formation of connective tissue, while in elephantiasis the hypertrophic processes of the connective tissue are diffuse and infiltrating, and there are also characteristic changes in the skin, which is practically unchanged in fibroma and fibromyoma.

These tumors frequently do not arise from the pudendal organs proper, but from the round ligament, and only later on in their growth and development descend into and encroach upon the pudendum. Fibrous tumors starting primarily from the fascia of the pelvis may likewise, in the course of their development and growth, descend into the pudendum and present as tumors of the latter.

The fibromata and fibromyomata of the pudendal organs have been observed at all ages, from about the age of puberty until long after the climacteric period. They may be single or multiple. Their growth is usually slow, but they may become very large in size, reaching down to the knees, and weighing as much as fifteen pounds and more. When these fibrous tumors attain a large size they have a tendency to become pedunculated. Some fibromata show a pedunculated character from the start, forming small, elongated projections from the integument of the labia majora. They have been described as fibroma molluscum, or molluscum pendulum of the vulva.

The larger fibromata of long standing are apt to become ulcerated on the surface by pressure and lack of proper care and cleanliness. They are also liable to undergo calcareous degeneration. Another secondary change to which they may become subjected consists in an extensive edematous infiltration, in consequence of which the fibers composing the neoplasm become pushed apart. Such tumors are not hard, but rather soft; they may even show pseudofluctuation, and microscopically their tissue looks very much like a myxoid degeneration, though it really only represents an extensive edematous infiltration. Fibromata so changed have frequently been reported as myxomata or myxofibromata.

PATHOLOGY OF MYOMATA OF THE VAGINA

Myomata are the rarest of all neoplasms of the vagina. They are usually rounded, very rarely reaching a size larger than an orange, though tumors weighing as much as two pounds have been observed.

They are almost invariably solitary and usually sessile, only exceptionally forming a pedicle.

Their favorite location is the upper portion of the anterior vaginal wall.

The cause of these tumors is still obscure. They are most frequently met with in middle life, though they have been observed in children. Von Recklinghausen has advanced the theory that these tumors are in reality adenomyomata, which have their origin in the remains of the Wolffian ducts, which view, however, still lacks confirmation.

These tumors grow from the fibrous or muscular coat of the vagina, and are usually imbedded in a fibrous capsule. Their histologic structure is identical with that of fibroids of the uterus, consisting largely of connective tissue bundles with a rather sparse intermixture of smooth muscle fibers. Striped muscle fibers are occasionally to be seen, in which case the tumor must be classed as sarcoma, especially when occurring in children. The mucous membrane covering the tumors is usually intact, unless destroyed by pressure, when they will present ulcerated surfaces. Fibroids of the vagina may become edematous or gangrenous and sloughing, and may be cast off in this manner.

Polypi are simply fibroids which have become pedunculated. They do not differ essentially in structure from fibroids.

PATHOLOGY OF MYOMATA OF THE UTERUS

Myomata of the uterus may arise from any part of the muscularis. They may, therefore, originate in either the body or the cervix. They vary a good deal in size, shape, and position. They may be single, but more frequently they are multiple.

One not infrequently finds in uteri removed for some other cause, or obtained from the post-mortem table, very small myomata which have not given rise to any symptoms. On the other hand, these tumors may attain an enormous size. Stockard saw in a colored woman a myoma weighing 135 pounds, and Hunter reports the finding post mortem of a myoma weighing 140 pounds, while the rest of the body weighed 95 pounds.

According to their seat and mode of origin myomata are divided into (a) submucous, (b) interstitial, and (c) subserous (Fig. 286).

(a) *Submucous myomata* have their seat under the mucous membrane (Fig. 286a). They may be attached by a broad base to the muscularis, or they may—and this is more commonly the case—become pedunculated and project polyp-like into the uterine cavity. These myomata are generally rich in blood vessels and muscle fibers and comparatively soft. They usually grow rapidly, but rarely attain a very large size. If by their growth they are forced down into the cervical canal they sometimes assume an hour-glass or dumbbell shape. They have a marked tendency to undergo degenerative changes and to slough.

The descent of these submucous myomata is often due less to their own neoplastic growth than to edematous swelling in consequence of circulatory disturbances and to contractions of the uterus. These muscular contractions of the womb may sometimes bring about the spontaneous separation and delivery of a submucous myoma.

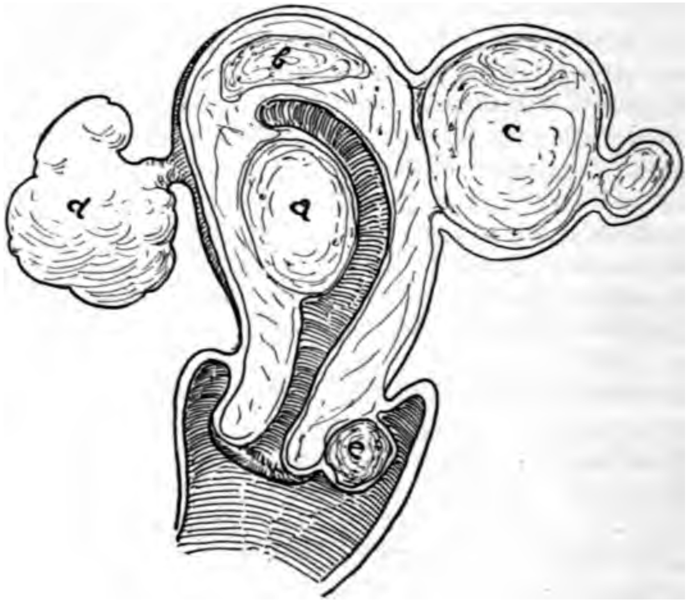


Fig. 286.—Diagrammatic Representation of Different Varieties of Uterine Myomata. (a) Submucous; (b) Interstitial; (c) Subserous fibroid, with a secondary subserous nodule, and an interstitial whorl; (d) Subserous, pedunculated, with secondary nodules and whorls; (e) Small cervical.

(b) *Interstitial fibromyomata* develop in the middle stratum of the muscularis uteri (Fig. 286b). They are, as a rule, well encapsulated, and can, therefore, be easily enucleated. Only rarely is this variety intimately blended and connected by interlacing bundles of muscle fibers with the surrounding parts. If such interstitial tumors grow very large they may so stretch the parts of the uterus below that these form a kind of peduncle for the tumor. Such peduncles may in rare cases undergo torsion.

(c) The *subserous fibromyomata* are developed from the most superficial layers of the muscularis and project from the peritoneal surface (Figs. 286c and d). They are connected with the uterus by a more or less constricted short peduncle. Smaller subserous myomata have also a broad base, but the larger ones are generally pedunculated. The peritoneum firmly overlies the tumor and is intimately blended with it so that it can not easily be peeled off. These tumors, in consequence of their usual mode of attachment to the uterus, are generally more or less movable. The peduncle may undergo torsion or kinking. Subserous myomata are very liable to form adhesions with the neighboring sexual organs, with the intestines, and with other structures. Myomata of this variety, springing from the lateral margins of the uterus, often grow into the broad ligament, separate its layers, and give rise to what is known as *intraligamentous fibromyomata.*

The evolution of the different types of uterine myomata is graphically shown by the serial diagrams of Josephson (Fig. 287).

Histologically, as stated by Herzog, the fibromyomata of the uterus consist of the same tissues as compose the muscularis of the uterus, namely, involuntary, smooth muscle fibers, and fibrous connective tissue. These two kinds of tissues are present in varying proportions. Some tumors may contain only a small amount of fibrous connective tissue, while in others it may so predominate that an almost pure fibroma exists. The muscle cells are arranged in bundles which cross each other and interlace with a great deal of variety and irregularity. Yellow elastic fibers are likewise found, also those particular cells known as "mast cells" and "plasma-mast cells."

There is one class of fibromyomata, fully described in a classical monograph by von Recklinghausen, the *adenomyomata* which in their origin clearly stand in a causal nexus with certain embryonic inclusions in the uterus.

Veit, in an article on the etiology and symptomatology of fibromyoma, comes to the following conclusion: "So far as the common myomata (excluding adenomyoma) are concerned, I hold that their origin from an embryonic inclusion ('anlage') has not been proved. It appears, however, that heredity plays a rôle therein, and one is also able to understand that irritation, acting chronically upon the uterus, may give rise to the formation of myomata; the *modus operandi* of the latter, however, is not yet clearly proved."

A particular variety of myoma is the adenomyoma. These tumors are ordinarily of moderate size, and are generally found near the serous surface in the posterior uterine wall and near the tubal angles. They are not encapsulated, but shade off diffusely into the surrounding tissues, and contain, besides the usual tissue elements of fibromyoma, epithelial structures. These latter are of a peculiar glandular type. There are generally seen a number of smaller ducts which communicate, like the teeth of a comb, with a larger duct. These epithelial structures are derivatives of remnants of the Wolffian duct and of the "urnière" of the Wolffian body, which have been displaced in development, and which, as embryonic inclusions, give rise to peculiar new

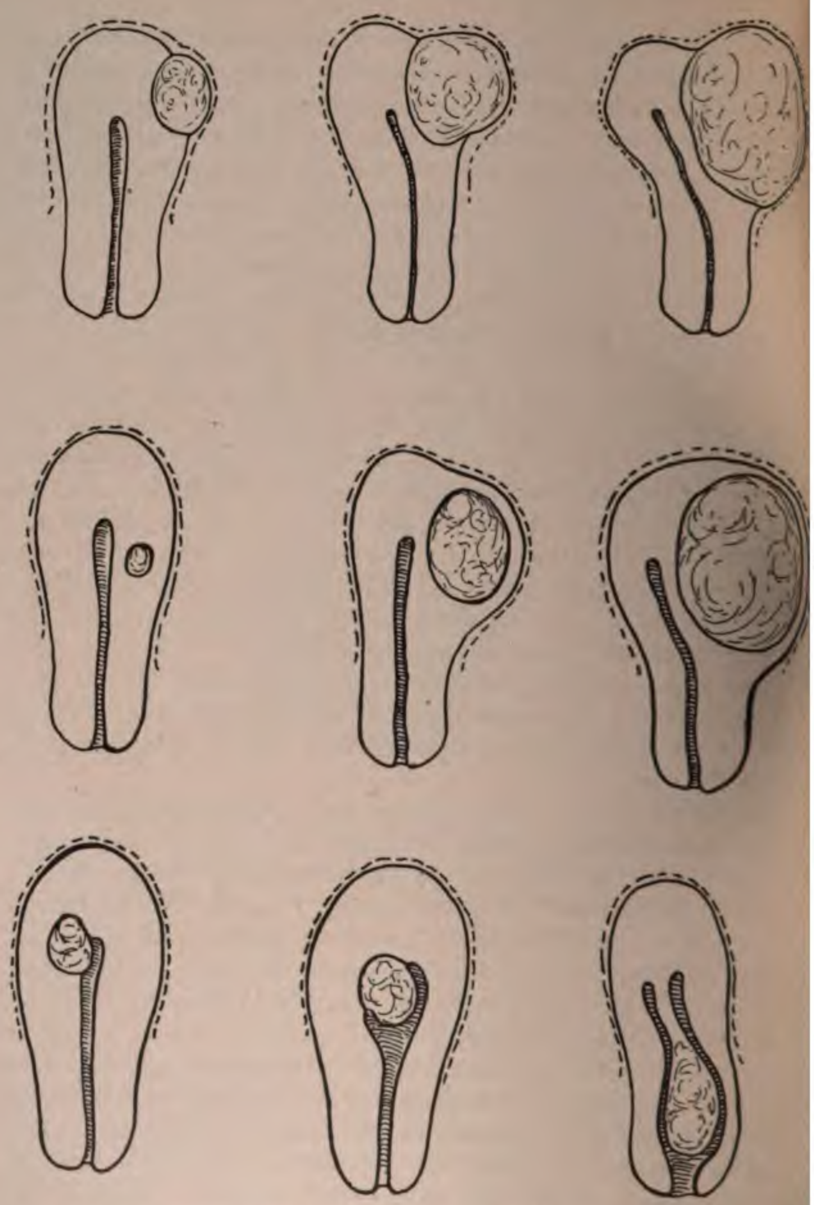


FIG. 287.—EVOLUTION OF DIFFERENT TYPES OF MYOMATA. Upper row subserous development of an originally subserous nodule; the middl shows subserous development from an originally interstitial nodule; the row shows the development of an intrauterine polypus from an orig submucous nodule. (After Josephson).

growths. The latter, from a histological standpoint, must be looked upon as a mixture of connective tissue and epithelial neoplasms.

The uterus itself undergoes various changes as a result of fibromyomata. The muscular coat, particularly if the new growth is so situated that it causes uterine contractions, is liable to undergo some hypertrophy characterized by an increase in size of the individual muscle cells. The uterine mucous membrane shows either a glandular or an interstitial hypertrophy. Herzog has also frequently observed an extensive edematous infiltration of the mucosa, with or without capillary interstitial hemorrhages. Tubes and ovaries are likewise affected when large myomata are present in the uterus. Endosalpingitis, salpingitis interstitialis, and oöphoritis interstitialis, with condensation of the ovarian stroma and round-cell infiltration, have been described.

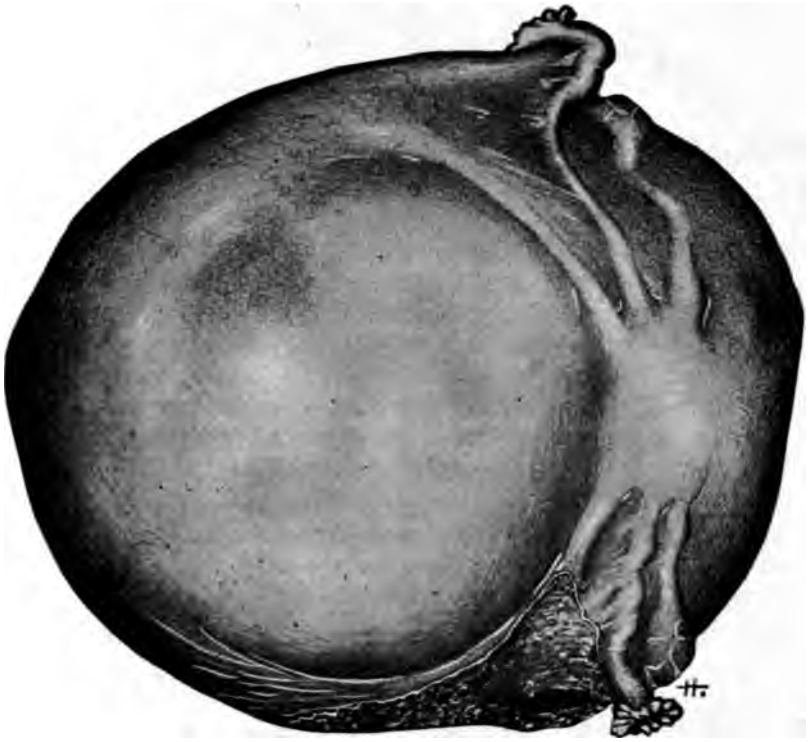


FIG. 288.—AUTHOR'S CASE OF AN AGED PATIENT FROM WHOM HE REMOVED A LARGE INTERSTITIAL FIBROID OF LATERAL DEVELOPMENT WHICH HAD DISTENDED THE BROAD LIGAMENT CARRYING THE OVARY AND FALLOPIAN TUBE OF THAT SIDE NEARLY TO THE UMBILICUS.

Retrogressive, involutional, or degenerative changes occur in myomata. Atrophy sometimes occurs after pregnancy and after the menopause has been established, and under other conditions. Calcareous degeneration is common, and small particles of carbonate and phosphates of lime are very frequently found in myomata. Or there may be formed a solid stone or a shell composed of lime salts. Herzog examined a case of the latter kind. The specimen was obtained by an operation performed by Dr. M. L. Harris on a woman seventy years old. It formed an elliptical mass about 14 cm. long, consisting of a shell several mm. thick, composed of lime salts. I removed from an aged patient a large interstitial fibroid of lateral development which had distended the broad ligament, carrying the ovary and Fallopian tube of that side nearly to the umbilicus (Fig. 288). On opening the tumor a shell of calcareous matter and several foci of calcareous degeneration were found (Fig. 289). Fatty degeneration is also frequently seen; it often leads to the formation of cystic spaces in the tumor. Myxomatous degeneration, inflammation, necrosis, and sloughing are observed in fibromyomata. Amyloid degeneration has been once described by Stratz. Of malignant changes in a primarily benign myoma the sarcomatous degeneration is the one most frequently met with. Von Recklinghausen has seen several cases of carcinoma developing in adenomyomata. The other mixed tumors, myochondroma and myoosteoma, have been described, as well as rhabdomyoma of a sarcomatous type.

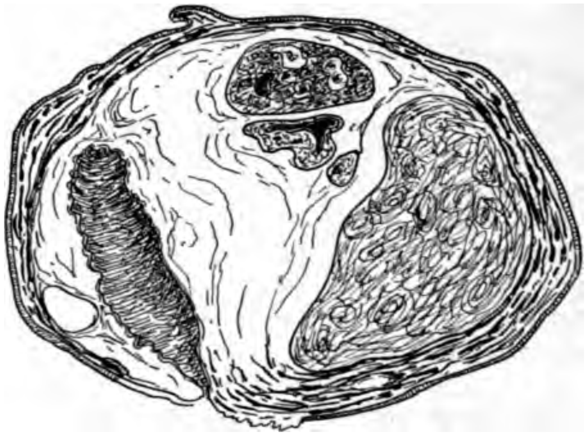


FIG. 289.—A LARGE MYOMA OF LONG STANDING REMOVED FROM AN ELDERLY SUBJECT. It contained numerous foci of calcareous degeneration. The darker striæ of the capsule are the layers of a calcareous shell.

The time of life when fibromyomata usually occur is that of sexual activity, but there have been reported a number of cases of this kind in children and in women after the climacterium. A good deal has been written upon the subject of the influence of prolonged virginity and abstinence from sexual intercourse, married life, abnormal sexual irritation, sexual excesses, masturbation, and so forth upon the development of fibromyoma, but without sufficient data to justify conclusions. Heredity has likewise been considered as a factor in the production of these neoplasms. Race has been cited as a predisposing cause. It is well known that many American writers hold that myomata are much more common in the negro than in the Caucasian races.

PATHOLOGY OF MYOMATA OF THE OVARIES

Myomata of the ovaries are of rare occurrence. I once saw one removed by D. S. Young, at the Cincinnati Hospital, 14 by 19 cm. in greater dimensions. Kelly and Cullen report a similar case.

PATHOLOGY OF MYOMATA OF THE INTESTINAL WALL

Myomata of the intestinal wall may occur. I have seen but a single case. The tumor, about 6 by 10 cm., grew from the transverse colon, which was displaced into the pelvis.

Complications of uterine myomata are various. They may occur with neoplasms of the ovaries, kidneys, and intestines. Displacements of the kidney, intestines, stomach, and liver may be associated conditions. Adhesions may develop between the tumor and any approximated surface in accordance with Coffey's law that, under aseptic conditions, pressure will cause the peritoneal endothelium to disappear with resulting fusion of the approximated surfaces. These lesions are especially prone to occur in the pelvis. The frequent coincidence of myoma of the uterus with infection of the Fallopian tubes has been noticed by every operator of large experience in hospital practice.

PATHOLOGY OF MYOMATA OF THE KIDNEY

Myomata, or possibly more properly fibromata, occasionally occur in the kidney. They are generally found in small white nodules, located near the base of the pyramids. In other cases they are very large. They are sometimes cystic. In some cases they seem to spring from the capsule; in others they are obviously derived from the kidney proper.

Wilkes described a large fibrocartilage-like growth, white and hard, about the size of a child's head, occurring in a subject fifty-three years of age. Dickinson had a case weighing six pounds. Billroth removed a fibromyoma weighing nearly 40 pounds from a woman thirty-five years of age. Morris is of the opinion that the cases of both Wilkes and Dickinson were cases of degenerated sarcomata. He says that small encapsulated fibromata are often present in the midst of healthy renal tissue, cervical or medullary. In larger tumors there is a gradual disappearance of kidney tissue from pressure.

[illegible] clinical [illegible] He states [illegible] independent le- [illegible] the primary [illegible] them in his [illegible] 1877 was of [illegible] extravasa- [illegible] and myoma have [illegible] that Virchow [illegible] and Schetelig [illegible] of the [illegible] mental origin [illegible] same. Sänger then quotes the cases of Schmidt and Mikulicz. That of the former was a case of fibrosarcoma weighing 8 kilograms (17.60 pounds); it sprang from the right broad ligament, had a long, tolerably thick pedicle, and occurred in a patient thirty-three years old. The latter was an edematous fibromyoma weighing 5 kilograms (11 pounds), and developed in the left broad ligament of a nullipara aged twenty-two years and single. The latter tumor was of slow growth, was complicated with ascites, and had a very thin pedicle. Both patients recovered.

These tumors are rare, but they do occur sufficiently often to demand the full attention of every gynecologist and abdominal surgeon. According to Rosenwasser:

Olshausen	found	among	280	ovariotomies	20	intraligamentary	
Wylie	“	“	500	“	6	“	
Mundé	“	“	154	“	18	“	
Rosenwasser	“	“	12	“	6	“	
		Or	946	“	50	“	=18.85 p. c.

Sänger (1880) remarks: “I have the conviction that our experience with solid tumors of the broad ligament will be like that with parovarian cysts. At one time believed to be great rarities and practically unimportant, they have been observed so frequently that every laparotomist must take them into account.”

SYMPTOMS AND DIAGNOSIS OF MYOMATA

SYMPTOMS AND DIAGNOSIS OF MYOMATA OF THE VULVA

The spherical character of the growth, its chronicity, and absence of pain and sensitiveness are diagnostic indicia of importance. The origin of the tumor in the external ring indicates its connection with the round ligament and its consequently pure myomatous character. The differential diagnosis is important only as relates to a possible hernia. This is best settled by exploratory operation.

SYMPTOMS AND DIAGNOSIS OF MYOMATA OF THE VAGINA

A spherical growth in the wall of the vagina, movable, slow of growth, painless, and free from tenderness on touch is probably a myoma. Carcinoma is rarely primary in the vagina, and is multinodular and more or less fixed when it does occur. It should be remembered, however, that myomata of the vagina are liable to undergo sarcomatous degeneration, and for this reason, as well as for any physical inconvenience they may provoke, they ought to be removed. The possibility of hernia of the vagina should be held in mind. The patient should be examined both standing and lying down. Varicose veins sometimes cause tumors of the vagina.

The treatment is exclusively surgical.

SYMPTOMS AND DIAGNOSIS OF UTERINE MYOMATA

Myomata of the uterus are insidious in their early development. They often attain considerable size before attracting attention, and then only by the tumefaction that they induce. In the majority of cases, however, pain is a conspicuous symptom, and is the result either of pressure or of associated inflammatory disease of the Fallopian tubes and ovaries. The pain of pressure is determined more by the site of the tumor than its size. Thus, when growing from the lower uterine segment and packing the pelvic cavity, the pressure on bowel, bladder, and nerve trunks will be more severe than when the tumor is situated higher and rises freely above the brim of the pelvis. The ovaries and tubes are often found in a mass of inflammatory adhesions, and hydrosalpinx and pyosalpinx are not uncommon accompaniments of these tumors. Such complications may render small fibroid tumors painful in the extreme. Irritability of the bladder and obstipation resulting from pressure of the growth are common symptoms. Hemorrhage, while not invariably present, is a common and conspicuous symptom of uterine fibromata. Profuse and prolonged menstruation is a marked and characteristic symptom. It is not uncommon to observe the most profound anemia in consequence, the patient's skin assuming a waxy, yellowish hue, with anemic heart murmur and profound general exhaustion.

Myomata are common in women of all races and of all ages, though more frequent in negroes and in women between the ages of thirty and forty years. Although found prior to puberty in rare instances, these growths are essentially incident to the menstrual period of life. Unmarried and sterile women are especially prone to this disease.

The bimanual touch will disclose the presence of a tumor, usually irregular in outline, and attached to the uterus. If the tumor is large its firm consistence and nodular character may be detected by palpation through the abdominal parietes. Interstitial fibromata of symmetrical development may be mistaken for pregnancy (Fig. 290), an error more easily made from the fact that pregnancy not infrequently coexists with these tumors. Pregnancy occurring either alone in a normal uterus or as a complication of myomata can sometimes be excluded by the absence of the usual signs of pregnancy, e. g., turgescence of the cervix, enlargement of the breasts, darkening of the areola, and reflex vomiting. Ballottement in advanced cases is significant, but not conclusive, as tumors with long pedicles may give rise to confusion. The fetal heart may or may not be heard, as the circulatory sounds—i. e., placental and uterine bruits—are liable to be greatly exaggerated

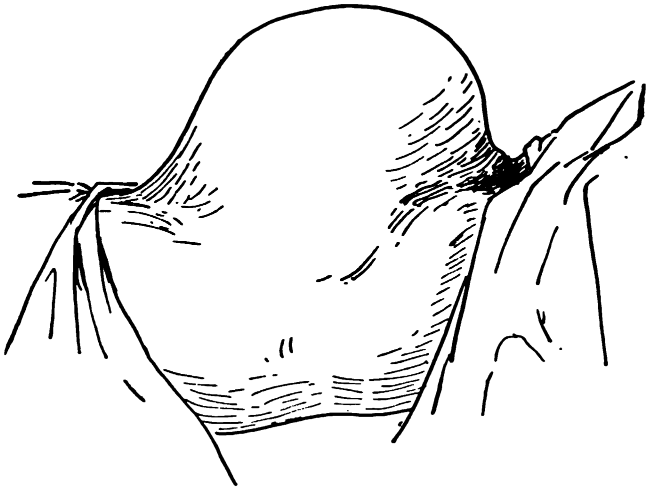


FIG. 290.—A LARGE SMOOTH MYOMA OF THE UTERUS, THE CONTOUR OF WHICH IS STRIKINGLY LIKE THAT OF AN ADVANCED PREGNANCY.

Where serious doubt exists on this question an exploratory abdominal incision is a justifiable means of diagnosis. The soft fibroma, especially if edematous, is distinguished with difficulty from an ovarian cystoma; and when cystic degeneration has taken place in the fibroma diagnosis is impossible. Diagnosis is also practically impossible between polycystic ovarian cystoma with general adhesions and symmetrical uterine fibroma. The clinical importance of these difficulties, however, is offset by the practical fact that both classes of tumors should receive the same treatment, viz.: removal by abdominal section. The vaginal portion of the cervix is rarely involved by fibroid changes in the uterus. A small fibroid in the posterior uterine wall may be mistaken for retroflexion of the uterus; and such a tumor springing from the supravaginal cervix may be interpreted by the touch as inflammatory exudate. Such errors can be avoided only by careful study of the symptoms and history of individual cases, with painstaking bimanual examination, after the bladder and bowel have been thoroughly emptied. McMurtry correctly observes that instrumentation *per vaginam* and digital exploration *per rectum* will rarely afford any special

ACTINOMYCOSIS INFECTION

This condition has been observed by Zemann, the lumen of the Fallopian tube being filled with pus in which the parasite abounded. The microorganism (*Streptothrix actinomyces*) attacked the walls of the tubes, which were thickened and granular. The origin of the infection was not determined.

SECTION VI

NEOPLASMS

CHAPTER I

MYOMATA OF THE FEMALE GENITOURINARY ORGANS

Myomata are variously and interchangeably designated as myomata, fibromata, fibromyomata, and fibroids.

They may develop from any fibrous stroma. In gynecologic practice they occur (a) on the vulva, (b) in the vagina, (c) the uterus, (d) ovaries, (e) kidneys, and (f) the intestines.

PATHOLOGY OF MYOMATA

PATHOLOGY OF MYOMATA OF THE VULVA

Among the benign true tumors of the vulva, myomata, fibromata, and fibromyomata are probably the most common, though they are by no means frequently met with. These new growths take their origin from the subcutaneous connective tissue of the labia majora and labia minora, more rarely from the clitoris.

Myomata of the vulva form hard, somewhat nodular, roundish, oval, or elongated masses, covered by normal skin.

Histologically these tumors consist of newly formed, wavy, fibrous connective tissue, very poor in nuclei, which is surrounded by a capsule made up of a condensed tissue of the same type. The skin is generally somewhat movable over the capsule, and is not much changed in its structure and appearance. The tumor proper frequently contains, besides fibrous connective tissue, non-striated involuntary muscle fibers or cells, so that the neoplasm assumes the character of a fibromyoma.

Pure myomata of the vulva are very rare, though they have been observed occasionally. While the tumors of the fibromyomatous group are, as a rule, firm, hard, and solid, there may occur in them, in consequence of lymph stasis, lymphangiectatic spaces of large extent. In a case of this kind diagnosis between fibromyoma and elephantiasis [illegible] gauze. [illegible] The [illegible] the material indicated and [illegible] mechanical effect in holding the uterine [illegible] upon a tension, [illegible] hemostatic influence. The packing [illegible] removed and at once re[illegible] at once the cervix will not need to be again [illegible]. The packing should at no time be removed without preparation being at hand to reapply it should bleeding again begin.

Adrenalin may be given subcutaneously with some advantage, although [illegible] for hemostatic purposes in these cases. Postural treatment may be of advantage in temporarily relieving pressure from large myomata. The patient may assume the knee-chest position for a few minutes several times daily with advantage. In some cases I have had satisfaction in having patients lie on their backs, head downward on an inclined board, one end of which is placed on the [illegible] the bed or other support. With gentle manipulation in this position, which should be about 45 degrees, the patient herself may work the tumor out of the pelvis. This should be done cautiously at first, for trouble may result from traction on Fallopian tubes that are unsuspectedly infected and filled with pus.

Various drugs have been recommended as either curative or beneficial in the treatment of fibroid tumors of the uterus. Such medicinal agents as ergot, [illegible] and some preparations of iron have enjoyed [illegible] being especially in repute for controlling hemorrhage, arresting growth and diminishing the size of the neoplasm. It can be [illegible] demonstrated that such agents do not [illegible] by impairing digestion and producing [illegible] are harmful in their general influence upon the system. [illegible] constantly influenced by [illegible] such as menstruation and [illegible] may readily be made by the [illegible]

The [illegible] injections of ergot and [illegible] misleading and [illegible]. Such treatment [illegible] in consequence of the [illegible] thereby. The per[illegible] has taken the place of [illegible] the tumor is of [illegible] serious symptoms [illegible]. The requirements of individual cases must guide the practitioner in the determination of these important considerations.

Surgical Treatment.—The so-called conservative surgical treatment of uterine myomata consists in efforts to arrest the growth and effect the absorption of the tumor. The effort to accomplish this purpose has included two expedients. One has been the extirpation of the ovaries. This operation was based upon the theory that following the induction of the menopause involutional changes would occur in the growth. Experience has taught the error of this view. Myomata frequently grow true to their original type after the menopause, both artificial and natural. In other cases they assume a sarcomatous type and grow rapidly. In all cases the patient loses the ovaries and the important influence exerted by their internal secretion in conserving the functions of her economy. It were better to remove the tumor and leave the healthy ovaries. It is needless to say that in all but the hands of a few the practice has fallen into disuse.

Ligation of the uterine arteries has been and is yet sometimes practiced to arrest hemorrhage, stop the growth, and effect the absorption of these tumors. This operation, while generally unsatisfactory, has a more scientific foundation than the preceding. I have had recourse to it in a few cases with success. In each instance the radical operation was indicated and might preferably have been done, but the stout objections of the patient led to the ligation procedure. In all five cases the hemorrhage stopped; in three of them the tumors gradually shrank; in the other two they remained stationary. In one only did the growth entirely disappear. It had reached the level of the umbilicus; three years later the uterus was apparently normal in size. In all cases, while the surgical convalescence was prompt enough, the subsequent improvement came slowly, and was in many particulars so unlike the happy recovery of practically all hysterectomies that I could not look upon the cases, even in the light of their outcome, as anything but relatively unsatisfactory.

125. PROCEDURE FOR LIGATING THE UTERINE ARTERIES FOR MYOMATA OF THE UTERUS (VAGINAL ROUTE)

(1) With the patient in the dorsal position the cervix is seized with traction forceps, and, if easily practicable, drawn down.

(2) The wall of the bladder is held up by a retractor.

(3) An incision is made in the vaginal wall around the anterior aspect of the cervix, and the septum between the uterus and bladder is split up to the peritoneal fold.

(4) The dissection is carried out laterally by the use of the finger or gauze until the pulsating uterine artery can be felt on either side.

(5) The dissection is then carried backward on either side of the cervix until the respective uterine arteries can be isolated between the thumb and finger.

(6) Two ligatures of chromic gut are then passed around each uterine artery, about 1 cm. apart, firmly tied, and the artery cut between.

(7) The vaginal incision is then closed.

This procedure is often made difficult, if not impracticable, by the fact that the cervix is drawn so high up in the pelvis that it cannot be reached. When the tumors are very large the cervix cannot be drawn down. A chief objection is the fact that possible serious complications within the pelvis are unexplored.

126. PROCEDURE FOR LIGATION OF THE UTERINE AND OVARIAN ARTERIES FOR UTERINE MYOMATA (ABDOMINAL ROUTE)

(1) With the patient in the Trendelenburg position the abdomen is opened in the median line.

(2) The tumor is drawn to one side and the ovarian artery on the exposed side is ligated just beneath the Fallopian tube.

(3) Another ligature is placed around the uterine artery, where it is felt on the side of the uterus. These ligatures should be of linen or some other non-absorbable material.

(4) The other side is similarly treated.

(5) The operation is completed with closure of the abdominal wound.

The distortion of the parts in cases of large myomata sometimes makes this procedure difficult. The great objection to it is the uncertainty of its ultimate results and the fact that in doing it almost, if not quite, as much surgical work is incurred as in the radical operations of myomectomy and hysterectomy.

In approaching the radical treatment it is well to have a distinct understanding of some of the terms employed. The terms myomectomy and hysteromyomectomy both indicate operative procedures for the removal of fibroid tumors of the uterus. The former term is applied to the operation in which the tumor or tumors are removed and the uterus preserved; the latter indicates the removal of the uterus in part or in whole along with the tumor. *Hysterectomy* properly denotes removal of the uterus without regard to the presence of neoplastic formations, but is habitually used as synonymous with the term hysteromyomectomy in treating of fibroid tumors. Hysterectomy may be partial or complete. The term *supravaginal hysterectomy* is applied to amputation of the uterus at the internal os, leaving a cervical pedicle; ***complete*** *hysterectomy,* involving the removal of the entire uterus, including the cervix, is often termed *panhysterectomy.*

The indications for radical interference are various, but positive. The operations for the removal of fibroid tumors have reached a stage of perfection that elicits admiration and commands confidence. Since we have learned to control hemorrhage in these operations the indications for the operation have advanced beyond the limitations that obtained a few years since. Those who have practiced the removal of the ovaries for the reduction in size of a myomatous tumor, or for the purpose of staying the growth of such a tumor, know well that the convalescence in such cases is fraught with serious complications that give the operator a great amount of anxiety. As a consequence of the rapidity with which a circulatory change takes place in these tumors after ablation of the ovaries, suppuration occasionally sets in, the tumor begins to break down, and the patient becomes desperately ill. An experienced operator, therefore, will be more anxious to remove fibroid tumors entirely than to remove the ovaries alone. It is, therefore, becoming a serious question as to which operation, in skilled hands, performed according to modern methods, is the more serious of the two. That is, whether the operation of abdominal hysterectomy or myomectomy, when performed for the removal of moderate-sized tumors, is more serious than the removal of the ovaries from their position alongside such tumors. Indications for the removal of such tumors are: rapid growth, grave hemorrhages from the uterus, ascites, compression on important organs, suppuration or degeneration of the tumor, and pregnancy under certain circumstances. When the tumor grows rapidly it may undergo malignant degeneration or become edematous. Small pedunculated tumors are not likely to be reduced in size as a consequence of the removal of the ovaries.

When these tumors give rise to pressure symptoms their removal is necessitated.

Myomata with a history of infected appendages demand removal.

Adhesion symptoms demand surgical interference.

The possibility of a symmetrical mass being a pregnant uterus and the possibility of pregnancy coexisting with a manifestly myomatous tumor must always be kept in mind. A woman aged 44, married 18 years without conception, who had not menstruated for 14 months, came to me with a diagnosis of fibroid of the uterus. She came specifically for operation for a tumor which did not rise to the umbilicus. I did not hesitate to open the abdomen, when I found a normally pregnant uterus. She recovered from the exploratory operation, and was delivered a month later of a full-term, but greatly undersized, normal fetus.

Her recovery revealed that she had also a small interstitial fibroid, which has not since bothered her. It is a matter of great practical importance to determine whether the life of a mother is endangered and operation consequently imperative, or whether pregnancy and parturition may be safely completed without surgical intervention. While it is exceptional for a woman with a large uterine myoma to become pregnant, numerous cases are recorded where the uterus has proved equal to the demand and carried the child to safe delivery near to or quite at full term. Under the stimulus of pregnancy, with its increased blood supply, fibrous tumors grow rapidly, and small tumors, hitherto unnoticed, may become conspicuous. It is also true that after delivery fibromata participate in the retrograde changes in the uterus and shrivel to insignificant proportions.

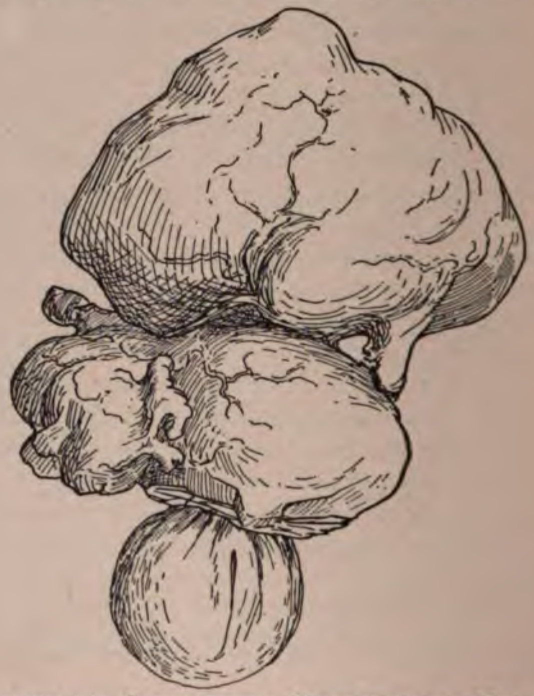


FIG. 291.—PREGNANCY COMPLICATING MULTINODULAR MYOMATA OF THE UTERUS IN A CASE BY THE RANSCHOFFS, *pere et fils*. The unruptured sac is seen protruding below.

In certain exceptional cases, where the tumor arises from the lower segment of the uterus and fills the lower pelvis, thereby obstructing the passage of the child, the vital question of operative intervention must be met and determined. Cases of obstructive myoma in which a successful operation was done have been reported by McMurtry. Similar cases have been reported by Price, Hanks, Reed, VanderVeer, Ross, Kelly, Cullen, and others. An illustrative case is the one of the Ranschoffs (Fig. 291); also one by Harrison Cripps (Fig. 292). This question should receive the most conservative consideration, for in many instances the uterus will bear its additional burden, and, if the tumor is above the pelvic brim, or can be pushed above when labor comes on, safe delivery of a living child may be accomplished. The operative procedure in hysteromyomectomy wherein pregnancy is a complication does not differ in any essential particular from the operation when performed in uncomplicated cases.

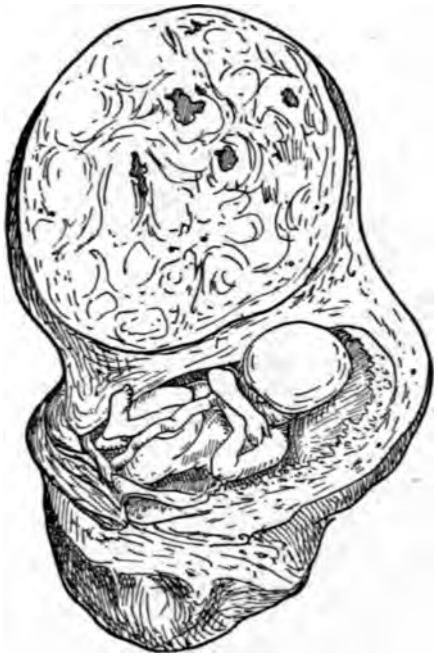


FIG. 292.—HARRISON CRIPPS' CASE OF MYOMA COMPLICATING PREGNANCY.

127. PROCEDURE FOR MYOMECTOMY

(1) The patient in the Trendelenburg position, the abdomen is freely opened in the median line, and the intestines retracted and retained by the gauze roll.

(2) The uterus is carefully explored and the tumor or tumors brought into view.

(3) If it is determined to proceed with a myomectomy the base of the uterus is encircled twice with a controlling ligature, consisting of a piece of rubber tubing, the ends of which are held by forceps.

(4) If the tumor is encapsulated, (a) the capsule of the tumo is then incised, (b) the tumor shelled out, and (c) the cavity or "nest" thus formed is closed by drawing in its sides with a continuous hemostatic suture and closing its outside layer by another similar suture.

(5) If the tumor is pedunculated transfix the pedicle with a lock stitch suture and cut off the tumor, leaving a "button" in the distal end to prevent retraction (see Fig. 293).

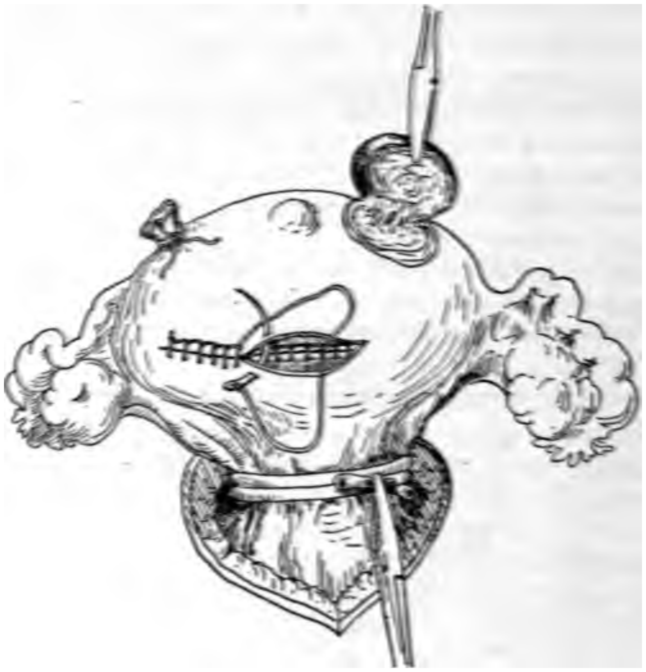


Fig. 293.—(127) Procedure of Myomectomy. (a) The uterus is encircled with the rubber tubing. A pedunculated tumor has been removed, and pedicle tied with transfixion ligature. An encapsulated tumor has been removed and its nest is being closed by a double row of hemostatic sutures and a third tumor is being enucleated.

(6) With the operation wounds under observation loosen the control ligatures; if there is no bleeding remove it; if there is much bleeding retighten the control ligature and control the bleeding.

When a tumor is single or pedunculated, or when there are but two or three nodules, the enucleation of interstitial myomata may be carried out. We must have our patients or their friends understand, however, that, if it is impossible to control the hemorrhage, the entire organ must be removed. Very large single myomata of the interstitial variety may be removed by myomectomy.

Some operators have recommended the removal of both ovaries if other fibrous nodules are present and beyond our reach, but it seems only reasonable to suppose that under such circumstances it would be better to remove the uterus in the ordinary way by the method of supravaginal amputation. Unless the operation is combined with castration there is always a danger of the development of a second tumor that may be overlooked at the time of the primary operation. To avoid this danger it is necessary to remove both ovaries. As a consequence this operation would seem to have but a limited field in cases in which it is not desirable to perform supravaginal amputation; in other words, it becomes an operation of expediency.

Many a young married woman may have a fibroid tumor that requires removal. She is willing to have the tumor removed, but she is not willing to submit to the more radical operation of removal of uterus, ovaries, and tubes. A subsequent pregnancy may, it is true, endanger her life, owing to the weakness produced in the uterine wall by the enucleation of a myoma, but if she is willing to take her chances it seems but fair that we should perform the operation for her in preference to that of supravaginal hysterectomy. Then, too, it should be explained that the uterus may be the seat of myomatous foci, too small to be detected at the time of operation, but that may later develop into large tumors.

In certain cases the fibrosis of the uterus is more or less diffuse, while in others it may be localized in the body or fundus of the uterus without particular involvement of either cornu. In such cases it is sometimes practicable to remove the central or myomatous portion of the uterus and reconstruct the organ itself from its lateral walls by the following:

128. PROCEDURE FOR MYOMECTOMY BY HEMISECTION OF THE UTERUS

(1) With the patient in the extreme Trendelenburg position a free incision is made in the median line of the abdomen and the fundus of the uterus is seized with strong traction forceps.

(2) The uterus is drawn down and the uterine artery on either side is ligated.

(3) A wedge-shaped piece is removed from the uterus by making two incisions, each starting from a common point at the vesicouterine fold and extending upward and outward through both the anterior and posterior wall to a point a little within the uterine ostium of the Fallopian tube (Fig. 294).

(4) The two lateral segments of the uterus thus formed are brought together and stitched by through-and-through hemostatic suture (Fig. 295).

(5) The hemostatic suture, if properly applied, will be sufficient to control any hemorrhage after the ligation of the uterine arteries (Fig. 296).

It is obvious that this procedure should not be adopted unless the tumor is so situated that it can be completely removed by this means. If after excision of the wedge-shaped piece it is evident that the lateral segments of the uterus are myomatous, the operation can be completed as a hysterectomy by hemisection (q. v.).

In the majority of cases the myomata develop above the cervix, and in such location and to such extent as to require removal of the entire involved zone of the organ. Operation for the removal of the diseased portion of the uterus must, therefore, be supravaginal. The evolution of this procedure has defined several stages. The earliest operations were done by extraperitoneal treatment of the stump with a clamp to

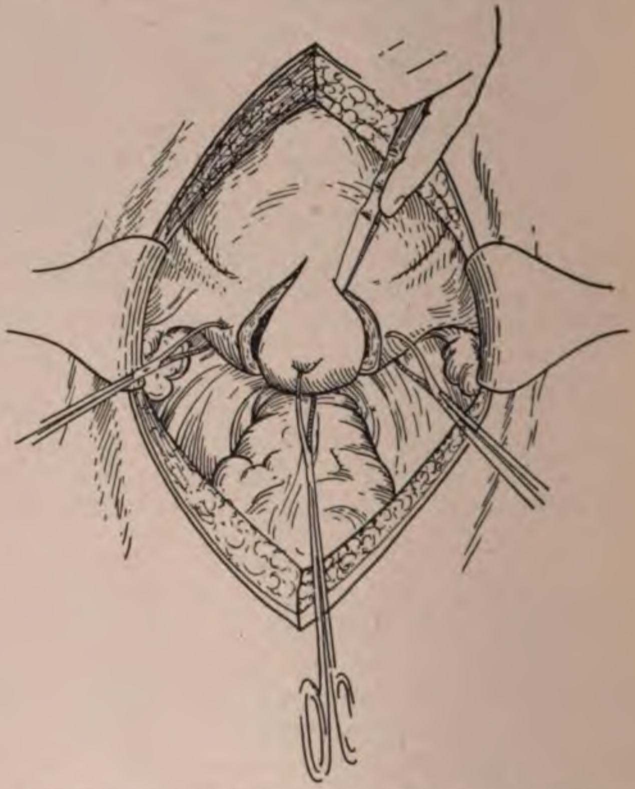


Fig. 294.—(128) Procedure of Myomectomy by Hemisection of the Uterus. (a) A wedge-shaped segment is being removed from the fundus and body of the uterus.

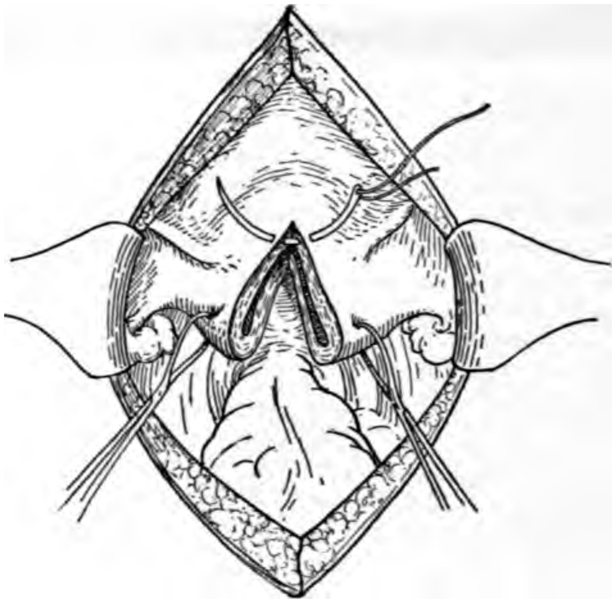


Fig. 295.—(128) Procedure of Myomectomy by Hemisection of the Uterus. (b) The wedge-shaped segment has been removed and the suturing has been commenced.

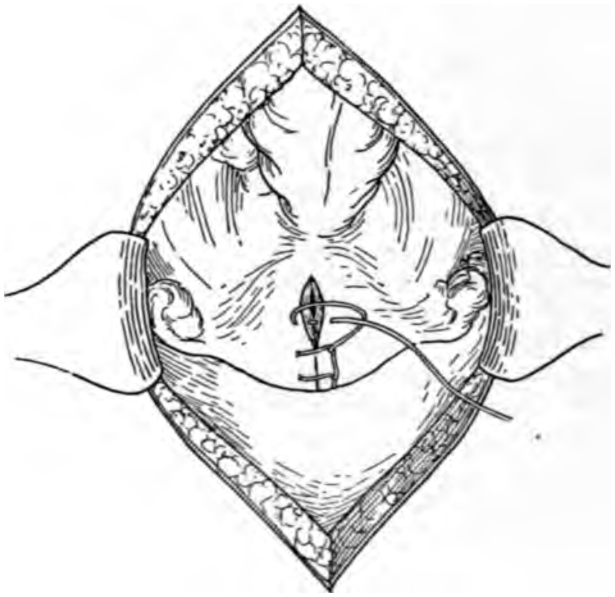


Fig. 296.—(128) Procedure of Myomectomy by Hemisection of the Uterus. (c) Final approximation of the lateral segments of the uterus by the continuous hemostatic suture.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

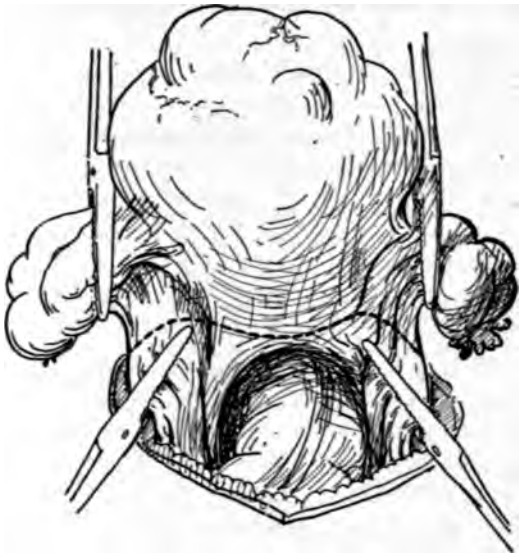


FIG. 297.—(129) PROCEDURE FOR SUPRAVAGINAL HYSTERECTOMY. (a) The uterus has been drawn up by lateral clamps, and the broad ligaments have been clamped. The dotted line shows line of proposed peritoneal incision.

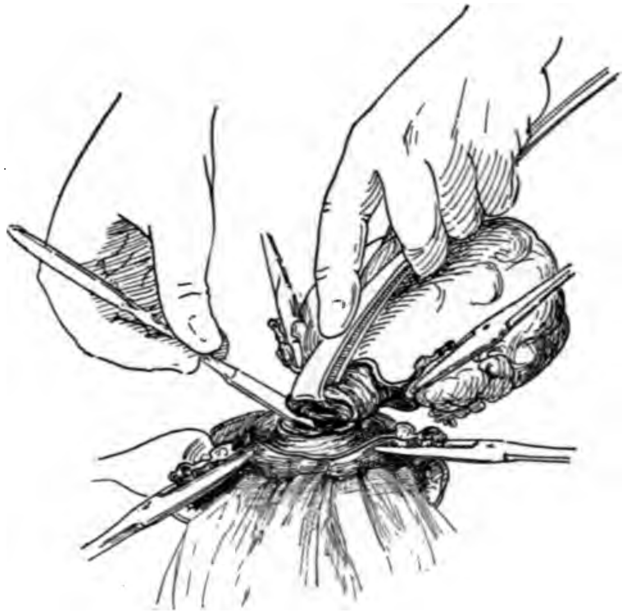


FIG. 298.—(129) PROCEDURE FOR SUPRAVAGINAL HYSTERECTOMY. (b) The dissection of the cervix has been carried well down towards the os, when the cervix is excised.

artery and one round ligament; then it closes the cervix (Fig. 300); then embraces the uterine artery and the round ligament on the other side, and, finally, the final loop ties the other ovarian artery (Fig. 301).

(11) Vaginal drainage is established if required and the abdomen is closed.

The original Schroeder procedure, as adopted by Kelly, differs from the preceding in the following important particulars: (a) I use the large upper clamps instead of two clamps to each round ligament, and a second lateral clamp on the broad ligament, my object being to minimize the number of instruments in the field of operation; (b) the original procedure contemplates the separate ligation of each blood vessel, which consumes several minutes of valuable time. Separate ligatures for the uterine arteries have been advised in the text, for purely precautionary reasons. As a matter of fact, I but rarely use them, employing the method of hemostasis, indicated in the diagrams. (c) In the original operation separate sutures are employed to close the cervix and to anchor the stumps of the uterine arteries to it; I accomplish the first by the continuous suture and find the anchorage of the arteries without obvious surgical advantage. (d) To stitch the ends of the round ligaments together, and to cover in the field of operation with a supplementary sagittal fold of peritoneum, as prescribed in the original technique, offers no advantage commensurate with the value of the time required to do it.

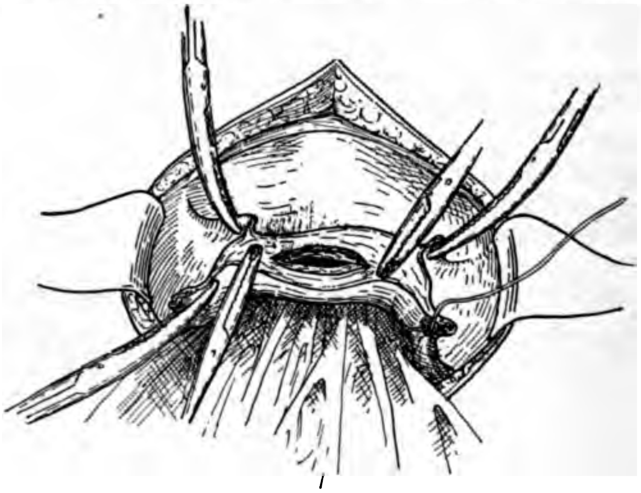


FIG. 299.—(129) PROCEDURE FOR SUPRAVAGINAL HYSTERECTOMY. (c) The uterus has been cut away; both uterine and the left ovarian arteries are clamped. The right ovarian artery has been tied with the beginning loop of the continuous hemostatic suture.

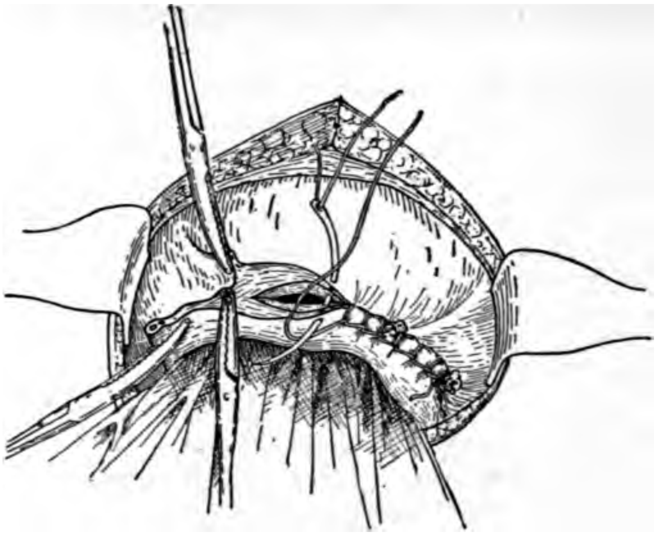


FIG. 300.—(129) PROCEDURE FOR SUPRAVAGINAL HYSTERECTOMY. (d) The continuous hemostatic suture is being applied; the right ovarian artery has been tied by the initial loop; the right uterine artery and the right round ligament have been embraced in an intermediate loop, and the transverse conical excavation in the cervix is being closed by the same suture.

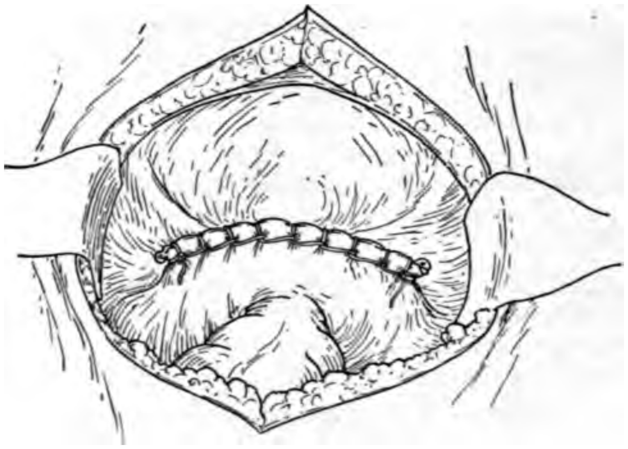


FIG. 301.—(129) PROCEDURE FOR SUPRAVAGINAL HYSTERECTOMY. (e) The pelvic diaphragm has been closed, hemostasis secured, and the cervix approximated with the continuous hemostatic suture.

The points which I urge in favor of my procedure may be better appreciated by a brief description of the

130. SCHROEDER PROCEDURE OF PARTIAL (SUPRAVAGINAL) HYSTERECTOMY

(1) The abdomen is opened and a clamp is placed on one broad ligament close to the uterus.

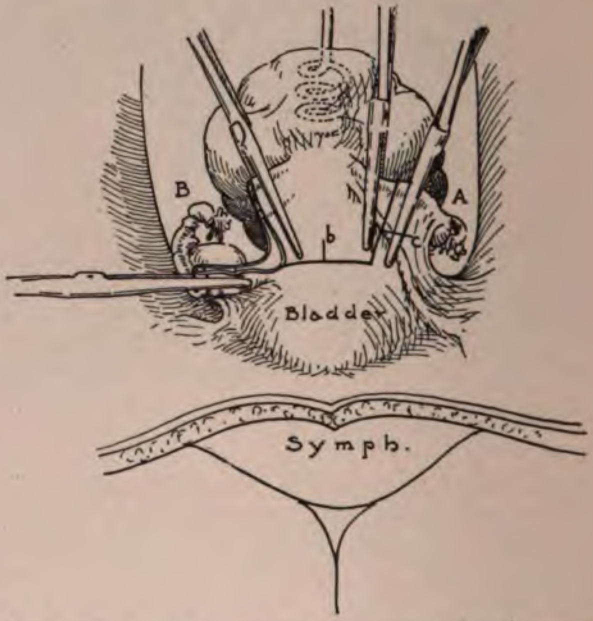


FIG. 302.—(130) SCHROEDER PROCEDURE FOR SUPRAVAGINAL HYSTERECTOMY. (a) The clamps are adjusted and the incisions are being made as indicated by the line. (After Jellett.)

(2) Another clamp is placed on the same broad ligament about 2 cm. nearer the pelvic wall.

(3) The broad ligament of the other side is similarly clamped.

(4) A Greig-Smith corkscrew is inserted in the fundus of the growth (Fig. 302).

(5) The broad ligaments are then divided to their base between the forceps.

(6) The incision of one side is connected with that of the other side by a transverse incision in the uterovesical fold and by a similar incision posteriorly.

(7) The uterus is then drawn up and excised at or just below the cervicocorporeal juncture (Fig. 303).

(8) The uterine arteries are seized as exposed, divided, and ligated.

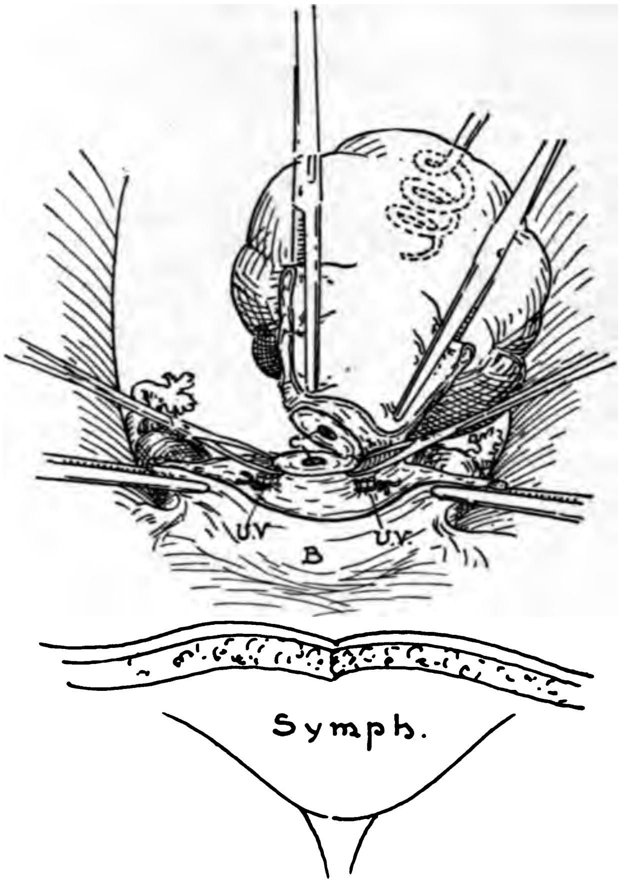


FIG. 303.—(130) SCHROEDER PROCEDURE FOR SUPRAVAGINAL HYSTERECTOMY. (b) A wholly unnecessary cork-screw is used to lift the uterus up, the uterine arteries have been tied, and the cervix is being excised. (After Jellett.)

(9) The cervical canal is then closed by a double line of sutures (Fig. 304).

(10) The pelvic peritoneum is closed by continuous suture, after which the abdominal incision is closed in the operator's usual way.

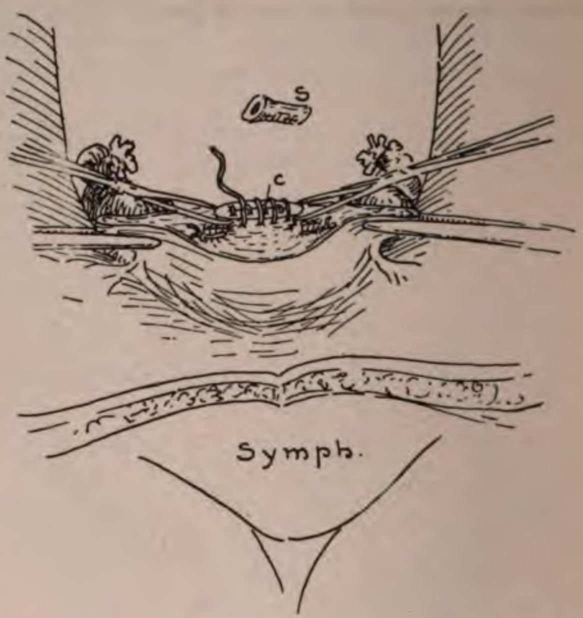


FIG. 304.—(130) SCHROEDER PROCEDURE FOR SUPRAVAGINAL HYSTERECTOMY. (c) The cervix is closed by a double row of sutures, after which the peritoneum is to be stitched over all, the ovaries and Fallopian tubes being left.

131. PROCEDURE FOR SUPRAVAGINAL HYSTERECTOMY BY HEMISECTION OF THE UTERUS WITHOUT REMOVAL OF THE APPENDAGES

(1) The patient in the Trendelenburg position, abdomen freely opened, adhesions are broken up, if possible, and the uterus brought up.

(2) A long clamp is placed on each broad ligament about 1 to 15 cm. from the uterus, and made to embrace the Fallopian tube, the ovarian artery, the round ligament, and the uterine artery.

(3) The fundus is seized with two traction forceps, one at each corner, and drawn down.

(4) A transverse incision about 2 cm. in length is made across the uterus at the junction of the body with the cervix.

(5) An incision is made at right angles to this and carried through the uterus, dividing it into two halves.

(6) Each half of the uterus is then removed, according to the conditions presented, by either of two methods: (a) the broad ligament is divided with scissors close up to the uterus, down to a point even with the base of the median uterine incision, where the half of the

uterus thus liberated is cut across and removed, (b) the half of the uterus may be seized with curved traction forceps at the cervical base, cut across, and removed by dividing the broad ligament from that point to its tubal margin, and the uterine artery ligated (Fig. 305).

(7) The same procedure is followed on the opposite side.

(8) The ovarian and uterine arteries on each side are then ligated.

(9) The end of a long suture is then passed through the anterior and posterior lips of the cervical stump and tied.

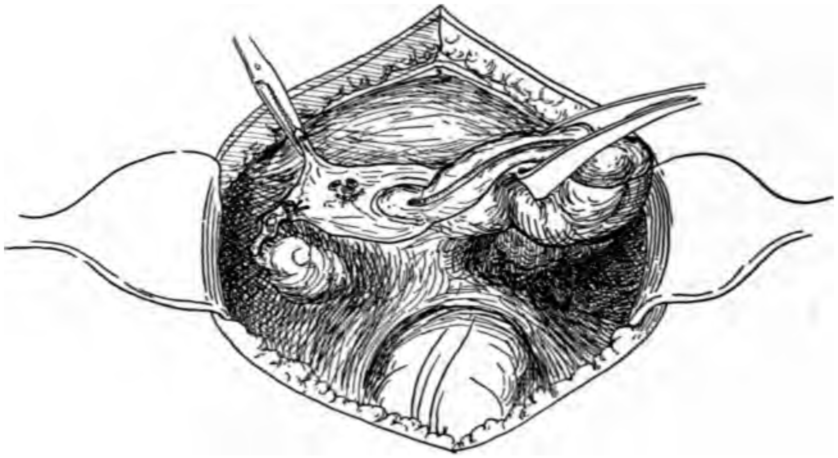


FIG. 305.—(131) PROCEDURE FOR SUPRAVAGINAL HYSTERECTOMY BY HEMISECTION OF THE UTERUS. The uterus has been divided, the left half removed, the left ovarian and uterine arteries ligated, the left Fallopian tube cut away, leaving the left ovary. The right half of the uterus will next be cut away with scissors.

(10) With the same suture, beginning at the cervix, the cut edges of the broad ligaments are stitched together in the median line and tied at the angle.

(11) The same or another suture is used to close the margin of the broad ligament, from which the Fallopian tubes were cut away.

The modifications of the original Faure-Kelly operation that I have just given are few but important: (1) the lateral clamps are necessary for preliminary hemostasis; (2) the removal of the segments of the uterus from above downward is often more convenient and more expeditious; (3) the removal of the Fallopian tubes eliminates a now functionally worthless structure, potential only for mischief, while conserving one of the most important functions of the ovary, i. e., its luteal or internal secretion; (4) the approximation of the broad ligament in the median line, following closure of the cervical stump, restores the parts as nearly as possible to their normal condition.

This operation is indicated largely as a matter of convenience in cases of small multinodular myomata, especially when complicated with infected appendages and adhesions. In these cases it is often desirable to place the preliminary clamp under the tube and between it and the ovary. The ovary ought not, of course, to be left if it is hopelessly diseased, but may be removed and the other left. In that event the original procedure for supravaginal hysterectomy described in the preceding paragraph may be adopted, the operator employing hemisection or not, as may suit his inclination.

132. PROCEDURE FOR ABDOMINAL PANHYSTERECTOMY

This procedure, which I devised in 1894, and which has proven entirely satisfactory, is as follows:

(1) The vagina is firmly packed with gauze, lifting the uterus up; all adhesions of the uterus and its appendages are broken up, and the uterus is lifted up into the abdominal incision. In some cases this manipulation can be done so satisfactorily with the patient upon her back that it is unnecessary to put her in the Trendelenburg position, although in most cases the latter posture is not only desirable, but necessary.

(2) The broad ligament is then clamped upon one side, just beneath the ovary and Fallopian tube, the clamp extending from the margin of the broad ligament to the side of the cervix.

(3) Another and smaller clamp is now placed on the broad ligament parallel with the previous clamp, but a quarter of an inch nearer the tubes.

(4) The broad ligament is then divided between the clamps, from its edge to the side of the cervix; the broad ligament on the other side is similarly clamped and incised.

(5) The vesical fold of the peritoneum is now dissected away from the front of the uterus, as is the peritoneum, covering the posterior side of the organ.

(6) The small clamps attached to the uterus are now hooked up by two fingers of the left hand, by which traction is made. As the uterus is drawn away from the vagina the dissection is made by means of the scissors held in the right hand. Care should be taken in making this dissection to avoid wounding the uterine arteries, which can be seen and clamped as soon as they are reached (Fig. 306).

(7) From this time on the dissection should be carried even more closely to the cervix, dividing the cervical tissues sufficiently to leave a slight ring of cervical tissue *in situ* after the cervix is withdrawn. If this precaution is not taken there is liability of wounding the azygos

vaginæ artery, the hemorrhage from which, while controllable, is embarrassing.

(8) When the vaginocervical juncture has been reached the point of the closed scissors may be thrust through into the vaginal canal. After this preliminary opening the remaining division of the vaginal mucosa is accomplished with facility.

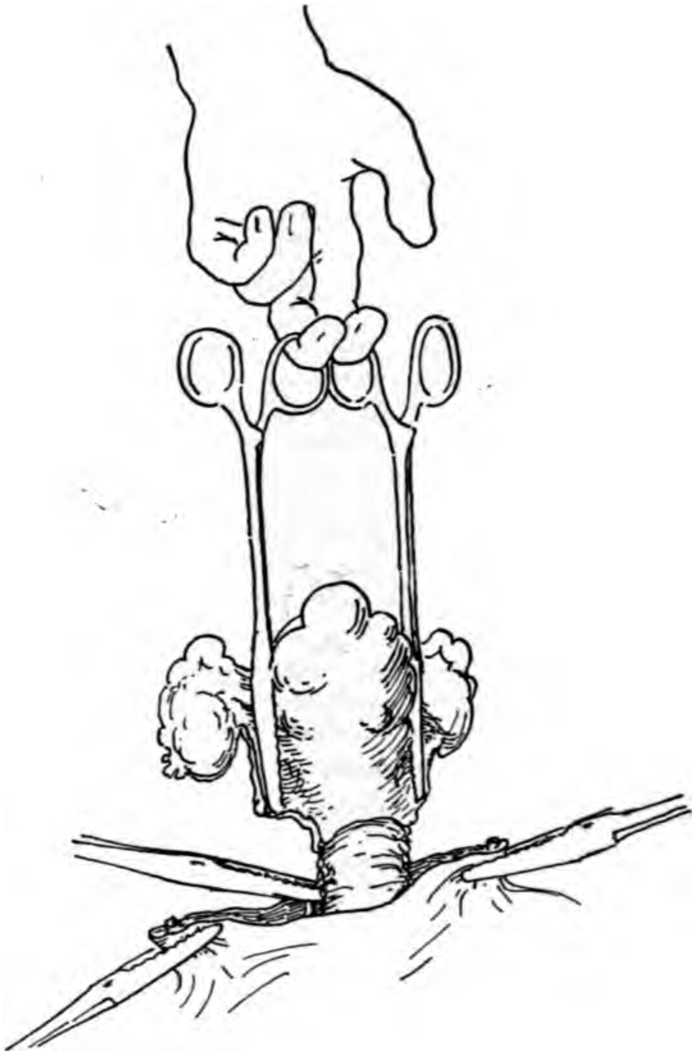


FIG. 306.—(132) PROCEDURE FOR ABDOMINAL PANHYSTERECTOMY. (a) The uterus is being lifted out by the two small Kocher forceps applied to each ligament, near the uterus. The anastomosing branches of the ovarian artery are clamped on each side, and the uterine artery is being caught as soon as exposed in the angle of the wound.

(9) The ovarian and the uterine arteries upon either side are next tied individually.

(10) All clamps are now removed and the field of operation is inspected to make sure of complete arrest of the bleeding

(11) The peritoneal margins are stitched together by means of a continuous hemostatic suture.

(12) Finally, the toilet of the peritoneum is made by means of dry sponging and the incision is closed by laminated sutures.

The specimen removed will show a complete uterus with the appendages and the exact area of the dissection (Fig. 307).

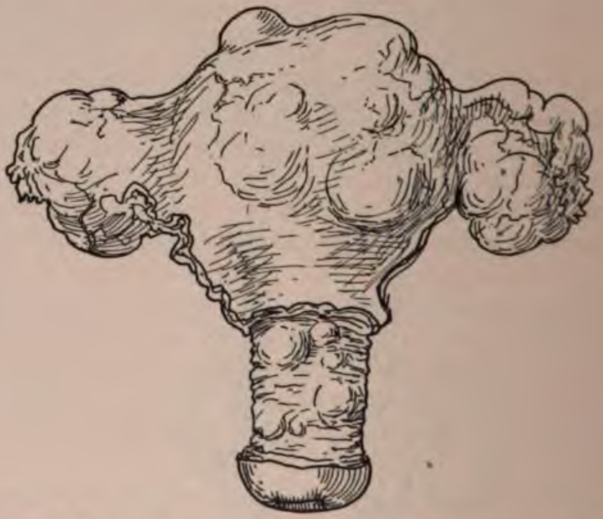


FIG. 307.—(132) PROCEDURE FOR ABDOMINAL PANHYSTERECTOMY. (b) The specimen, when removed, shows the uterus with adnexa in their entirety.

(a) If the case is complicated with infected uterine appendages, or (b) if the field of operation has become contaminated, or (c) if as the result of broken-up adhesions there is persistent oozing, or (d) if there is extensive denudation in the pelvis, gauze drainage ought to be established. This is done by passing one end of a long gauze pack from the pelvis into the vagina, and packing from the pelvis itself with the longer portion. This gauze should be removed through the vagina after 48 hours.

This operation is indicated when, as in the specimen shown, the cervix as well as the body and fundus is the seat of myomata.

The advantages of panhysterectomy are: (a) the contamination of the field of operation, which is liable to happen as the result of extension of infection from the endocervium in certain cases of supravaginal amputation, does not occur; (b) drainage by the vagina, when necessary, is easily and thoroughly accomplished; (c) with care in avoiding the azygos vaginæ artery hemostasis is readily secured and safely maintained. The resulting condition of the pelvic diaphragm is one of equal, if not greater, strength than that secured by the supravaginal operation. (d) If the technique above described is carefully followed the operation is done with greater facility than are others devised for the extirpation of the uterus. (e) Myomatous uteri of considerable magnitude may be removed *en masse* by this means.

133. PROCEDURE FOR VAGINAL MYOMECTOMY FOR TUMORS OF THE CERVIX

(1) After exposing the cervix by means of a Sims speculum and retractors an ample incision is made through the capsule of the tumor.

(2) The capsule is separated from the tumor with the finger or handle of the knife.

(3) The uncovered portion of the tumor is seized with a strong volsella forceps and traction upon, and rotation of, the neoplasm are made, while the finger is inserted between the tumor and its envelopes to sever its connections.

(4) Should there be any dense bands of tissue extending from the tumor into the underlying tissues they should be severed with scissors. Emmet's right-hand, lesser-curved, blunt-pointed scissors serve as an excellent substitute for the finger, and are ready at hand if needed to sever any bands.

(5) There is, as a rule, little hemorrhage. If needed hot water irrigation and packing the cavity with gauze will arrest bleeding.

Myomata restricted to the cervix are of rare occurrence. When, however, they are manifestly present in the cervix, and there is no evidence that the body or fundus is similarly involved, the above procedure may be resorted to. It should always be done with the understanding that myomatous developments are liable to occur higher up in the uterus.

134. PROCEDURE FOR VAGINAL EXTIRPATION OF SUBMUCOUS MYOMATA (VAGINAL MYOMECTOMY)

(1) The cervix is drawn down and dissected away from the bladder up to, but not through, the peritoneum.

(2) The anterior wall of the cervix is split in the median line to a point far enough above the internal os to permit of digital exploration of the body of the uterus (Fig. 308).

(3) The index finger is introduced into the cavity of the uterus and the myoma located. In many cases it can be seen.

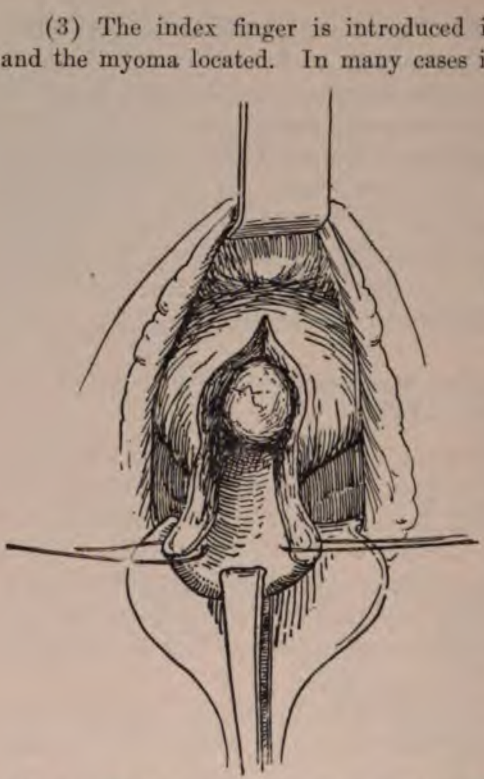


Fig. 308.—(134) Procedure for Vaginal Extirpation of Submucous Myomata. The cervix has been drawn down, dissected away from the bladder and the anterior wall split far enough up to expose the myoma.

(4) When located its capsule should be incised and when small (a) the tumor itself shelled out with a sharp bone curette or a saw curette (Fig. 309), or if large (b) it should be taken out piecemeal (morcellement).

(4) (a) *Technique of Morcellement.*—The dissection is carried out laterally into the broad ligaments and the uterine arteries are ligated; (b) the capsule of the tumor is incised and its enucleation by the finger carried as far as possible; (c) the presenting part of the tumor is seized with a volsellum or Péan forceps (Fig. 293), and as much of it as possible cut away with scissors; (d) this procedure being continued as long as there is any of the tumor left.

(5) If a small tumor has been enucleated and the hemorrhage from its *nest* is too free (a) it may be controlled by a hot sponge packed into the cavity; (b) a gauze tape with iodoform in it may be packed into the *nest* and left there, one end coming out through the cervix; (c) if this does not control the hemorrhage the uterine arteries should be clamped and ligatured as just described.

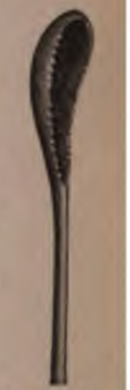


Fig. 309.—(134) T Thom Serrat Spoon-s

(6) The incision in the cervix is closed by interrupted catgut sutures and the uterus replaced.

(7) The incision in the vaginal wall in front of the cervix is closed by interrupted catgut sutures.

This operation may be undertaken in young subjects with whom the function of menstruation and possible reproduction, or at least the hope of possible reproduction, are matters of importance. It should be done with the understanding that intramural nodules may have escaped attention and that there may consequently be recurrence of the trouble.

135. EMMET PROCEDURE OF MORCELLEMENT

(1) The cervix is dilated to the extreme degree, or until the myoma can either be seen or felt.

(2) The neoplasm is seized at its lower portion with strong hooks or volsella forceps and forcibly drawn downward.

(3) As it descends into the vagina, portions of the tumor are cut away and removed, the remaining portion is again seized and powerfully drawn upon, and once more the presenting part is cut away.

(4) And so the process is carried on, until finally the base of the tumor is reached. It will now be observed that, in consequence of the powerful traction, a pedicle has been formed which, in some of Emmet's cases, was no larger than the index finger and consisted of the coverings of the tumor.

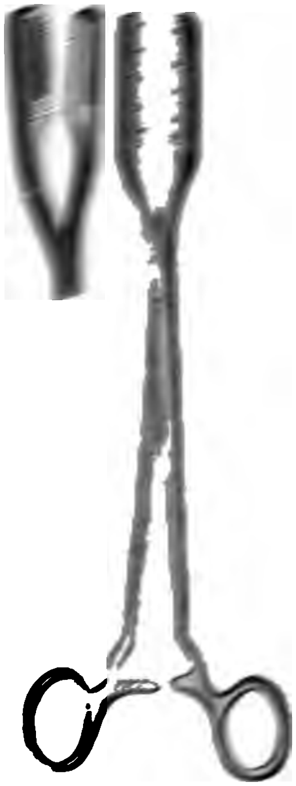
(5) This base is severed and the last of the tumor is removed. The traction upon the tumor stimulates uterine contraction, so that as the tumor descends the uterus follows, closely encircling the neoplasm. If necessary the descent of the uterus may be aided by pressure upon the fundus from above the pubes.

(6) Injections of hot water into the cavity of the uterus may be made, if needed, to stimulate contraction or to arrest hemorrhage.

(7) In case of profuse hemorrhage during the process of extirpation the tumor should be removed as quickly as possible, hot water injections employed, and later, if necessary, gauze packing, or the uterine arteries may be ligated from below.

When the tumor is very large this method may be employed in preference to enucleation. Emmet is given the credit of priority in describing and putting into execution a systematic method of vaginal myomotomy by *morcellement*. It has often been denominated Emmet's traction method, but it comprises most of the essential features of what is known to-day as vaginal extirpation by *morcellement*. It differs from enucleation in that after dilatation of the os no effort is made to divide the capsule of the tumor, and sections of the neoplasm are made in the vagina. With the development of surgical exploration of the interior of the uterus by discission of the cervix, just described, this method of Emmet's is falling into disuse.

[illegible]



[illegible]

[illegible] of the uterus to the

[illegible] in principle from [illegible] specially devised ins[illegible] and other attachment[illegible] tumor, and the excisio the lips of the cervix and application of pressure forceps to bleeding vessels within the uterine cavity if the hemorrhage is profuse.

Both Emmet's and Péan's operations in cases of large tumors are formidable, and may in many instances be rejected in favor of vaginal or supravaginal hysterectomy. They are contraindicated when the uterus contains several tumors, and when there is suppurative disease of the uterine adnexa.

In view of the fact that foci of fibroid development may, and often do, exist in such size and localities as to defy detection in the remaining uterine wall, and in view of the frequent recurrence of fibromyomatous growths in uteri which have been subjected to myomectomy, many operators with good cause reject the latter operation. It is undeniable that hysterectomy is to be preferred in the majority of cases. It is argued that myomectomy is always a serious operation; that, as already stated, it often fails to bring the patient immunity, and that there is difficulty in detecting other commencing growths. This is all avoided by hysterectomy, the immediate dangers from which are no greater than from myomectomy. It is true that a few women have conceived and borne children after myomectomy, but this result is rare; sterility or, in the event of conception, abortion may be set down as of commoner occurrence.

137. PROCEDURE FOR EXTIRPATION OF CERVICAL POLYPI

(1) With a strong, long-handled catch forceps seize the pedicle near its attachment.

(2) By traction and rotation break up the attachment. But little force is required, and little bleeding need be feared, unless too strong traction has been exerted.

(3) Should hemorrhage appear it is best to cauterize the bleeding surface, if accessible, with the thermocautery.

(4) If the pedicle is broad and the polypus vascular incise the base with scissors and cauterize the cut surfaces with the thermocautery.

This procedure is available for small polypi originating within the cervix.

138. PROCEDURE FOR EXTIRPATION OF LARGER POLYPI BY ECRASEUR

(1) When the polypus is large, distending the vagina and obscuring a view of the pedicle, the point of attachment and the size of the pedicle should, if possible, be determined. This can usually be effected by a digital exploration.

(2) If the polypus is too large to permit of digital exploration a bent uterine sound can usually be carried round and above the polypus, when, by manipulation, the attachment can be felt and its size estimated.

(3) The loop of the wire écraseur may be carried around the tumor and the whole instrument gently carried upward toward the cervix. If a strand of piano wire is used there is usually little difficulty in encircling the pedicle.

(4) By leaving one end of the wire unfastened until the pedicle is reached it may then be drawn tight and the unfastened end of the wire wrapped around the post of the écraseur.

(5) A few turns of the screw will sever the pedicle.

(6) The tumor is then seized with traction forceps and withdrawn.

Tumors of this size and requiring this procedure are now but rarely encountered.

In all cases of intrauterine polypi, after the removal of one polypus, the cavity of the uterus should be explored, for occasionally more than one growth is present. Should hemorrhage follow the extirpation of the polypus from this region the intrauterine douche of hot water will usually arrest it. Vinegar in proportion of 1 to 3 or 1 to 2 is a valuable addition to the douche. If these plans fail the uterine cavity should be packed with plain sterilized or chemically asepticized gauze. The operator may choose between the Sims and dorsal positions. Duning and many other operators prefer the latter, with the limbs in the holders and the cervix exposed by a short, broad Sims or Jones speculum. The removal of malignant polypoid growths has not been considered in the foregoing remarks. They are best treated by total extirpation of the uterus (see Malignant Neoplasms of the Uterus and Vaginal Hysterectomy).

139. PROCEDURE FOR REMOVAL OF MYOMATA OF THE OVARIES

Large hard tumors of the ovaries (myomata) are removed by the same technique that is employed in uncomplicated cases of cystomata of the ovaries (see Procedure of Ovariotomy).

TREATMENT OF MYOMATA OF THE KIDNEYS

The treatment is exclusively surgical (see Exploration of the Kidney and Nephrectomy under Injuries of the Kidney).

TREATMENT OF MYOMATA OF THE BROAD LIGAMENT

The treatment of these solid tumors is exclusively surgical and by extirpation. The so-called palliative treatment has uniformly failed to palliate. The use of ergot, hydrastis canadensis, and electricity have been well tried by good, earnest, well-trained men. The results are anything but satisfactory, so far as a cure or decided relief is concerned. Apostoli, Keith, Engelmann, and many other able and painstaking investigators of the value of electricity in these cases have been disappointed in the results obtained, and it is pretty generally believed that the so-called "cures" accomplished, about 2.4 per cent. of many hundreds of cases, represent the possible percentage of errors in diagnosis. Unfortunately the result obtained with ergot, hydrastis canadensis, and iodid of potassium hypodermatically or *per os* is not better.

The only true remedy is removal of the tumor or tumors by enucleation through the abdomen; although Péan and a few others who have followed his method of *morcellement* have done so successfully, by accident rather than otherwise, by the vaginal route.

According to Olshausen, the credit of first presenting and recommending the essential features of the present mode of enucleating these growths belongs to Miner, of Boston (1869). The operation of enucleation is not a very difficult one if the tumor is not large and has grown toward the abdominal cavity rather than into the pelvis; but, when excessive in size, the tumor will occupy both the abdominal and the pelvic cavities. A tumor or tumors of but moderate dimensions may be so situated in the pelvis as to fill it out completely, thus displacing the pelvic viscera upward in every direction; in addition to this there may be numerous adhesions and other complicating diseases, which will make the operation very difficult and formidable. Martin, Hegar, Kaltenbach, Olshausen, Kelly, Baldy, and many others have clearly described how to proceed under the various conditions that may present themselves. The principal object to be attained is to avoid hemorrhage and injury to other structures as much as possible. The ureters, bladder, and the large blood vessels within the pelvis are especially endangered when the growth is very large or confined to the pelvis and the adhesions numerous and firm. Pedunculated, solid, intraligamentary tumors are very rare. Their removal is simple enough. The stitching up of the cavity left by the peritoneal folds after enucleation of the tumor is no longer practiced. Where the folds fall into apposition there is no need for sewing; where they remain separate, experience has shown that recovery is much more prompt when, after arrest of hemorrhage, the cavity is simply cleaned and the abdominal wound closed without drainage. Martin, Hegar, and Kaltenbach recommended drainage into the vagina. Greig Smith, Goodell, and Skene were the first to abandon it. At present drainage in th cases is, with most operators, a thing of the past. These growths a best removed by the Hall procedure for the removal of intraligamentar parovarian cysts (see p. 683).

CHAPTER II

CHORIOEPITHELIOMATA OF THE UTERUS

(*Syncytioma malignum*)

This is a form of growth the indefinite pathology of which is indicated by the fact that it has been variously designated by distinguished pathologists as syncytioma malignum, known also as deciduoma malignum, malignant placentoma, carcinoma syncitiale, sarcoma deciduochoriocellulare, deciduosarcoma, chorioepithelioma. It is a degenerative malignant disease of the sarcomatous type, originating in the decidual structures of the pregnant woman, and tending to a rapidly fatal issue (Figs. 311-312).

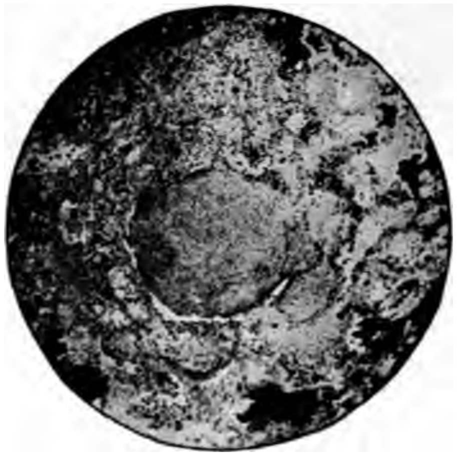


FIG. 311.—SYNCYTIOMA MALIGNUM.

Maier published in 1875 two observations on tumors of the body of the uterus; the tissue composing the tumors was distinctly decidual in character. Hegar subsequently reported the death of one of these patients from what he considered to be cancer of the uterus. Sänger in 1888 was the first to demonstrate this disease, and in 1893 to draw attention to its essential histogenetic character and to its pronounced malignant tendency. A number of cases have since been reported in various countries, and special studies of the disease have been made by Whitridge Williams in America and Roger Williams in England. Syncytioma is found in the uterus after delivery at full term, abortion, or mole pregnancy. It forms soft tumors, bleeding easily, variable in size, generally roundish and small, very malignant, and with a tendency to form early distant metastases.

These neoplasms are derived from the chorioepithelium of the placenta and they are, therefore, of fetal origin. On account of this fact they form one of the most peculiar malignant neoplasms known. We have here a tumor spreading in the mother which has taken its origin from fetal structures. There are, of course, quite a number of writers who assert that the syncytium of the placenta is of maternal origin. However, from his own work on the histology of the placenta and from the recent contributions of Van Heukelom, His, Peters and others, it is [illegible] that the syncytium is derived from the fetal ectoderm, and he, therefore, classifies syncytioma malignum under epiblastic epithelial neoplasms.

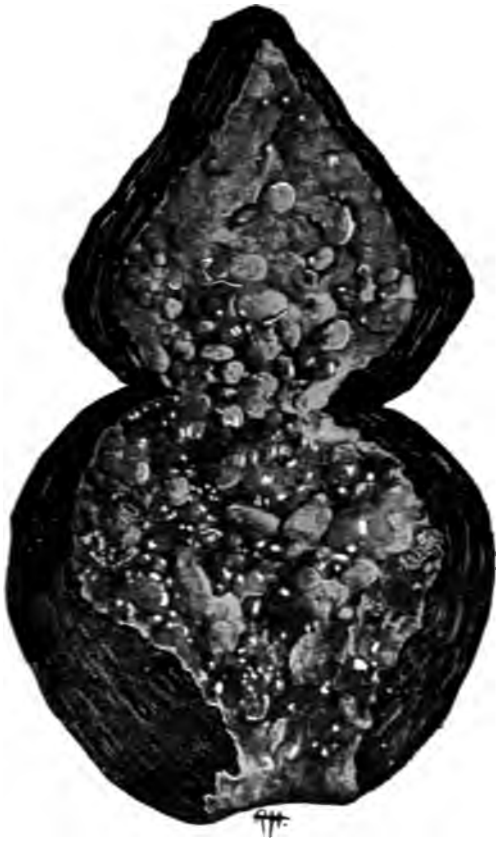


FIG. 312.—TYPICAL ADENOMA MALIGNUM OF THE [illegible] AS SHOWN IN OLIVER'S CASE (HIRST).

The tissue of these tumors shows protoplasmic masses in which are seen many nuclei, without, however, any cell boundaries being recognizable. These masses very much resemble syncytial buds. There are also found cells having the character of those of the Langhans' layer of the normal placental villi. Between the tracts of tumor cells are large open spaces [illegible] less [illegible] character the intervillous [illegible] in other words [illegible] of normal placental [illegible] chorionic villi, but all the [illegible] from the normal placenta [illegible].

The [illegible] It is a suggestive fact, however, [illegible] and 12 gave clear historie of previous "mole" pregnancy. Macnaughton Jones states that hydatidiform mole has been observed in 45 per cent. of the cases. The conclusion is, therefore, forced upon us that this form of intrauterine infection predisposes to the disease, which conclusion may further prove suggestive in regard to the general bacterial or parasitic origin of malignant diseases. Beyond this suggestive fact the etiology of malignant degeneration of the decidual structures is shrouded in as deep a mystery as that of other malignant diseases.

Symptoms and Diagnosis.—The most significant symptom is severe, intermittent hemorrhage following labor or abortion. This may occur immediately after the uterus has been emptied, or it may be delayed for some time, in which case its onset will be attended by the discharge of an hydatid mole. After the hemorrhage ceases a foul-smelling, dirty-colored, watery discharge generally ensues. Pain may or may not be present; but, when it does exist, it is frequently provoked by efforts of the uterus to expel clots. The patient is generally cachetic, loses flesh rapidly, and speedily shows signs of advanced anemia. Exploration of the pelvis will reveal a uterus more or less enlarged, even beyond what might be expected under ordinary circumstances at the same period following delivery. The cervix is generally found open, although this is far from a constant condition. Digital exploration of the uterine cavity will reveal coagula beneath which are found soft, vegetating masses. Cazin calls attention to the fact that the neoplastic products are frequently of such consistence that they may easily be mistaken for clots. The enlarged uterine wall is edematous and nonresistant, and may, therefore, be perforated with facility in the course of examination.

The diagnosis of syncytioma must depend, so far as the clinical features of the case are concerned, largely upon the history of pregnancy followed by parturition at term or by abortion; or, particularly, the history of hydatid mole. Due attention should be given to the symptomatology just recorded; the exact character of the generative process, however, can be determined only by microscopic examination of some of the tissue. This may be easily removed in some cases by the finger, in others by the curette. Another diagnostic sign of importance in cases of longer standing is the occurrence of metastases. These migrations, in consequence of the special tendency of this disease to invade the blood vessels, are manifested at an earlier stage than in other malignant diseases of the uterus.

Treatment.—The treatment must consist of nothing short of the complete removal of the uterus and adnexa (see Hysterectomy). This should be done as quickly as the diagnosis can be made. It should be remembered, however, that metastases occur very early in the history of these cases, and that, if their existence is detected, the operation offers the patient no hope, and is, therefore, unjustifiable. Roger Williams tabulated 14 cases of this disease that had been treated by vaginal hysterectomy; of these 12 recovered from the operation, while 2 died; of the 12 primary recoveries 5 died with recurrence within the first year; 6 of the remaining 7 were free from recurrence ten, nine, seven, seven, five and one-half, and three months, respectively, after the operation; nothing was said of the after-condition of the other patient.

CHAPTER III

CARCINOMATA OF THE FEMALE GENITOURINARY ORGANS

Carcinomata may occur in any of the organs or structures comprising the genitourinary apparatus of women. They will be considered here in connection with (a) the vulva, (b) the vagina, (c) the uterus, (d) the uterine appendages, (e) the urethra and bladder, (f) the kidney, (g) the rectum.

PATHOLOGY OF CARCINOMATA

PATHOLOGY OF CARCINOMATA OF THE VULVA

Carcinoma may develop as a primary disease in any of the vulval structures. It seems to be a disease of relatively advanced age. Winckel, who has seen 8, and collected from the literature 54 cases, found that 6 cases occurred in women under forty years; 16 between forty and fifty; 20 between fifty and sixty; and 20 cases in women over sixty years. It can not be shown that simple inflammatory processes or gonorrhea and syphilis exert any predisposing influence with reference to the development of carcinoma of the vulva.

The starting points for these tumors are the clitoris, labia majora, and labia minora, the perineum, and rarely the glands of Bartholin. In the case of the latter the carcinoma has a glandular, in all other cases a squamous, epithelial-celled type.

These tumors are generally characterized by an extensive new formation of tissue, by their inclination to early superficial ulceration, hard diffuse infiltration of the surrounding tissues, and involvement of the neighboring lymph glands, particularly those in the inguinal region. The glandular involvement, however, in some cases does not seem to supervene early.

The carcinomata of the vulva, from certain macroscopic features, may be divided into several groups, which are, however, not distinguished by fine microscopic differences. These forms are described by Herzog as follows:

One form is characterized by a prominent tumor formation. The affected portion of the vagina presents a roundish tumor, generally of moderate size, usually not larger than a hen's egg or an apple. It is firm and hard in consistence, situated in the upper layers of the integument, and more or less movable on the subcutaneous tissues. The surface is formed by an epidermis, which has a tendency to form warty prominences and papillary excrescences. If these tumors are seen somewhat later they are not so freely movable and their surface has become ulcerated. A second form takes on from the start the shape of a diffuse infiltration, which does not project materially above the level of the surrounding skin. On palpation of the neoplasm its site is found to be hard, and it is not freely movable, but, on the contrary, is firmly fixed to its surroundings. This variety likewise soon begins to ulcerate; its surface either shows a mass of shallow, uneven granulations, or a ragged tissue covered with a bloody, dirty, purulent exudate. The third form from the beginning has a marked tendency to ulceration, and presents a deep crater-like ulcer with hard, infiltrated, overhanging edges.

Carcinoma of the vulva is a typical squamous, epithelial-celled cancer. The epithelia of the stratum germinativum proliferate into the underlying connective tissue in the form of pegs or cylindrical masses, and these have a tendency to become branched. The proliferating cells speedily undergo cornification, and one, therefore, finds in carcinoma of the vulva epithelial pearls or "onion bodies" in great number and very typical in appearance. The younger epithelia, which have not undergone cornification and have preserved a columnar type together with the somewhat tubular branched character of the cell nests, may, on superficial examination, create the impression of a glandular, tubular carcinoma. This impression is, however, erroneous, for carcinomata of the vulva are true squamous-celled neoplasms, not glandular carcinomata, but "chancroids."

Secondary growths following previous removal frequently lose the characteristic structure of a chancroid, and present a tissue composed of a fibrillar stroma with only small epithelial nests, in which epithelial pearls are absent. There are frequently found in the neighborhood of carcinoma of the vulva, near the primary tumor or near recurring metastases, whitish patches of epidermis, which condition is known as leukoplakia. These spots microscopically show a thickening of the epidermis. They are not characteristic of carcinoma of the vulva, since they are also found in other conditions.

Carcinoma of the vulvovaginal glands, of which a few cases have been reported, forms a hard tumor situated under the unchanged labium majus. Microscopic examination shows an alveolar carcinoma with remnants of normal glandular tissue of the organ.

Carcinoma of the vulva, after it is once well established, generally spreads quite rapidly and has a tendency to grow around the urethra into the vaginal walls, into the pelvic fascia, and into the perineum. Involvement of the other labium majus from the opposite one originally affected has likewise been several times observed. The prognosis of carcinoma of the vulva appears to be somewhat better than that of cancer of the vagina, but recurrence and final death are the rule even after thorough removal. Goffe has reported a case of primary epithelioma of the clitoris followed by speedy lymphatic involvement.

PATHOLOGY OF CARCINOMATA OF THE VAGINA

Carcinoma of the vagina occurs as both (a) primary and (b) secondary.

(a) Primary carcinoma of the vagina was found by Gurlt in 114 cases out of a total of 59,600 patients. It is, therefore, to be classified among the uncommon diseases.

It is a disease of later life, and has not been met with under the age of twenty-five. It appears mostly as an ulcerating excrescence, with sharply circumscribed borders, and is most frequently located on the upper portion of the posterior vaginal wall. This was shown in a case by Küstner (Fig. 313). The surrounding mucous membrane is usually involved in a catarrhal inflammation, and is frequently eroded and bleeds on the slightest touch. Not infrequently a marked thickening of the mucous membrane in the neighborhood of the carcinomatous involvement appears as a diffuse infiltration, manifested as a thickening of the vaginal walls encroaching upon the lumen of the vagina. At first it may involve only a segment of the vagina, encircling its entire circumference like a band. In these cases ulceration is only observed after a considerable length of time. In the diffuse variety the growth is at first slow, but eventually infiltration of the perivaginal connective tissue takes place and the growth may invade the bladder or rectum, or extend into the parametrium, involving secondarily the iliac and retroperitoneal glands, or, in case the growth is confined to the lower third of the vagina, the inguinal glands may become involved.

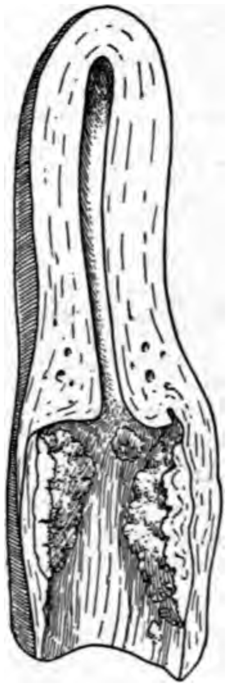


FIG. 313.—CARCINOMA OF THE VAGINA. (After Küstner.)

age. Married life and childbirth have an obvious influence upon the liability to carcinoma. An hereditary predisposition is likewise manifest.

Carcinoma of the uterus, as classified by Herzog, may take its origin from (a) the portio vaginalis, (b) the cervix proper, or (c) the body of the uterus.

(a) Carcinoma of the portio vaginalis is variable in its macroscopic characters, and a good deal in this respect depends upon the rapidity and the intensity of secondary, retrograde, destructive processes. The cauliflower excrescences, or polypoid carcinoma of the portio, arise from the lips, and form either broad bases or somewhat constricted pedunculated tumor masses, varying in size from a hazel nut to an apple. The surface of these neoplasms is never smooth, but uneven, with crevices and clefts. The macroscopic appearance is admirably shown in a case by Runge (Fig. 314). It may be pale and whitish or of a pinkish tint, but the color of the tumor itself is generally hidden from view by a dirty, seropurulent, bloody, greenish or yellowish secretion. In another form of carcinoma of this part of the uterus we find a diffuse infiltration and hardening of the portio. In early stages ulcerations may be entirely absent and the surface may be smooth. When this form begins to ulcerate there may be present shallow ulcers only,

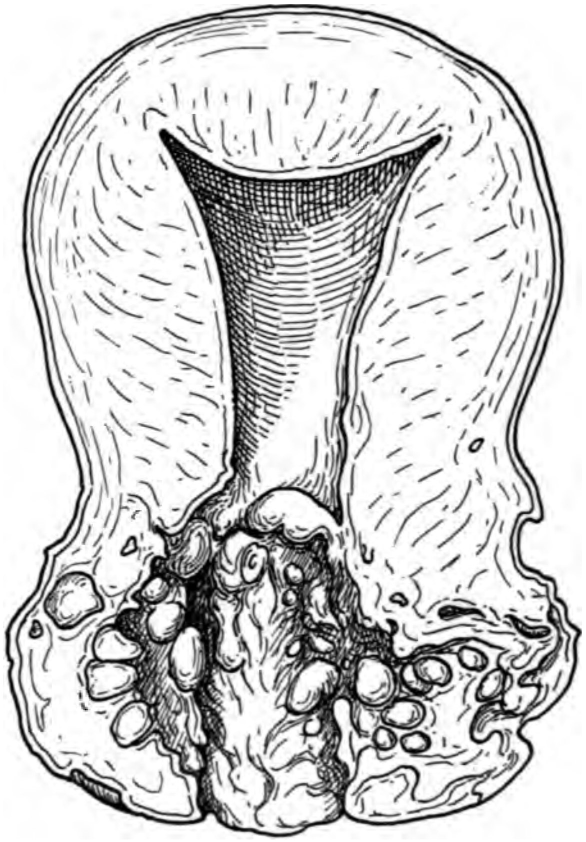


FIG. 314.—CARCINOMA OF THE PORTIO VAGINALIS. (After Runge.)

while in the forms first described the ulcerations usually lead
to great destruction of the tissue and form crater-like cavitie
In spreading carcinoma of the portio vaginalis generally first reache
and then infiltrates the vaginal walls. Early spreading into the cer
vical mucous membrane is rare. Involvement of the corpus ute
in primary carcinoma of the portio is quite rare. In thei
further growth these cancers infiltrate the lateral parametrium
The bladder is, as a rule, reached only late, and then from th
anterior vault of the vagina. Involvement of the rectum is rar
The lymphatics involved are those following the course of the ilia
vessels.

(b) Carcinoma of the cervix takes its origin from the surface o
from the glandular epithelium of this part. It usually begins as
circumscribed nodule or as a diffuse infiltration, involving either pa
or the whole of the circumference of the cervix. A very marked in
filtration formed in this manner may then ulcerate and lead to exten
sive loss of substance and excavation. Or there may be from the sta
a slight degree of infiltration only, with early shallow ulcerations an
destruction of the superficial layers. Spreading goes on from the cer
vix in the direction of the body. It may have the form of a superficia
ulceration along the corporeal mucous membrane, or it may be a diffus
or circumscribed lymphatic infiltration into the uterine wall. Spread
ing over the vaginal mucous membrane rarely, if ever, occurs, but late
on an infiltration of the deeper layers of the vaginal walls is commo
The pelvic connective tissue is generally invaded from the deepest pa
of the growth. The bladder is often involved early; the rectum, as
rule, late. Lymph gland involvement is similar to that in carcinoma o
the portio.

(c) Carcinoma of the body of the uterus starts from the corpore
mucous membrane. In the diffuse form the whole mucous membran
is more or less involved, and in places infiltrated with thicker roundis
or irregular nodules. The further development of the new growth en
larges the corpus uteri in all its dimensions, and the cavity become
markedly enlarged so soon as ulcerative processes and sloughing set in
Sometimes there may be only a circumscribed limited carcinomatou
process, while the major part of the mucous membrane is not involve
The polypoid form of carcinoma of the body is rare. When carcinom
of the corpus in its extension reaches the outer zone of the body ad
hesions to surrounding parts become frequent, particularly to the in
testines, which may become perforated by carcinomatous growth. In
volvement of the bladder and the rectum occurs late, as a rule. Th
lymph glands generally first involved are the lumbar glands in th
neighborhood of the aorta. There may be in all forms of carcinom

of any part of the uterus an unusual involvement of lymph glands in consequence of reversed metastatic transport.

Carcinoma of the uterus, considered histologically, is a malignant atypical neoplasm arising from epithelial structures and showing, as a rule, the well-marked alveolar arrangement so characteristic of cancer. Since we find two different kinds of epithelia in the uterus we also find carcinomata differing in the types of their cells. The cancers springing from the portio are almost invariably squamous-celled carcinomata. The epithelia lining the portio proliferate rapidly, and infiltrate the underlying connective tissue in the form of pegs or columns or pillars of cells. These cells in proliferating vary a good deal in shape, and deviate from the type from which they originally sprang. In the cervix, where we normally have no squamous but only cylindrical cells, we likewise find besides columnar-celled cancers squamous epithelial carcinomata. This is probably not so much due as some believe to a preceding or coinciding metaplasia of the epithelia as to a preceding substitution by which the columnar epithelium has been replaced by that of a squamous type. Carcinoma of the corpus consists, as a rule, of epithelia of the columnar type (Fig. 315). But it must be kept in mind that as soon as we have a well-developed alveolar arrangement in the neoplasm the epithelia have become so atypical in shape and size that one can speak with propriety neither of columnar nor of squamous cells; the latter under these considerations also lose their prickles.

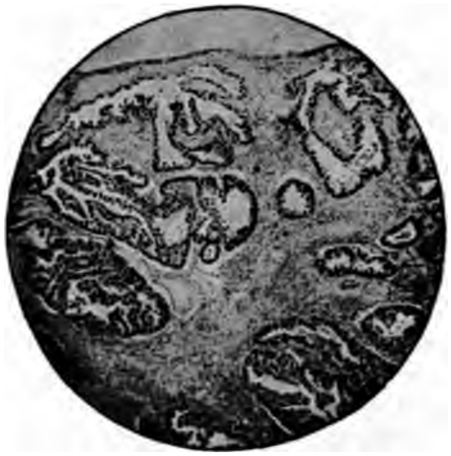


FIG. 315.—THE COLUMNAR EPITHELIUM REPLACED BY THAT OF A SQUAMOUS TYPE IN THE ENDOMETRIUM OF A CARCINOMATOUS UTERUS. (From microphotograph by Herzog.)

It is very difficult to distinguish between glandular hypertrophy and beginning carcinoma. Recourse must be had to atypical mitotic figures, which always speak strongly for tumor formation. These features will be more fully mentioned under the head of Sarcoma of the Uterus. Amann attaches a good deal of significance to the direction of the polar spindle with reference to the surface on which the epithelia are situated, in the matter of diagnosis between simple hypertrophy or malignant neoplasm. It is impossible here to go into the finer details of the microscopic diagnosis of carcin In a well-developed case, when it is, however, usually too late to op the histologic picture is so typical that even a tyro can make a m scopic diagnosis. While, on the other hand, in the very beginning, there is still time for a hopeful operation, it often requires del fixation, exact orientation, and general careful preparation of the m scopical material to enable even the expert to arrive at a definite clusion. In trying to get at the latter it is perhaps better, as s by Herzog in a paper on The Microscopic Diagnosis of Uterine S ings, to err on the side of too great a readiness to see atypical malignant features instea being too ready and pro overlook the former and t only hyperplastic proc particularly since the sus ed cases, as a rule, with exceptions occur in wom a period when the uteru accomplished its object fruit bearer, and when it moval is not objectio from physiological and s reasons.

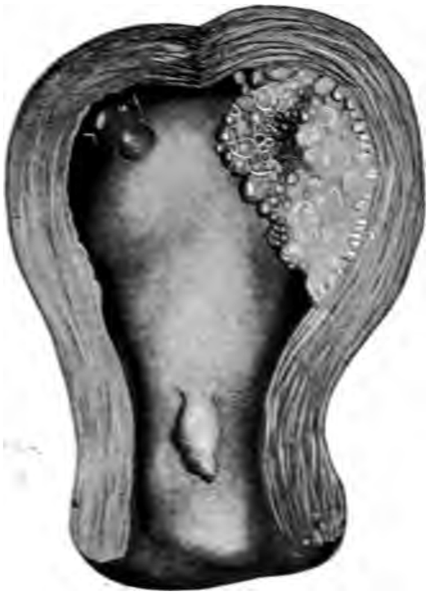


FIG. [illegible].—COEXISTENCE OF SARCOMA, CARCINOMA, MYOMA, AND POLYPUS. After Neibergal.

The coexistence of va benign and malignant plasms in the same ut while not frequent, is sionally encountered. Th existence of sarcoma, c noma, myoma, and polyp reported by Neibergal (316). In cases in which cinoma or other malig [illegible] have begun to disintegrate, mixed infections of the [illegible]

[illegible] sometimes a complication of carcinoma of the ce [illegible] has collected a series of one hundred and sixty-six cases. [illegible] which makes abortion probable [illegible] several years ago, to the State Medical Association a case of this kind in which amputati [illegible] by another operator in [illegible] which the patient was [illegible] when labor began, the cervix was found distinctly carcinomatous—a condition which, in the absence of necessary surgical aid, speedily resulted in the death of both mother and child. When the cancerous uterus is found to be impregnated, vaginal hysterectomy should be done in the earlier stages of the pregnancy; or, if the woman is permitted to go to term, she should be delivered by Cæsarean section or the Porro operation.

The disease is liable to occur at any age. Pozzi mentions a case by Ganghoffer of a child nine years old who died from medullary carcinoma. Gusserow accumulated the records of 3,385 cases showing the age at which carcinomatous diseases began as follows:

17 years	1	case (Glatter)
19 years	1	" (Beigel)
20 to 30 years	114	cases
30 to 40 years	770	"
40 to 50 years	1,196	"
50 to 60 years	856	"
60 to 70 years	340	"
Above 70 years	193	"

Pozzi maintains that poverty is a predisposing cause of carcinoma, and supports his contention by the statistics of Schroeder, showing that the disease is 1.5 per cent. more frequent in the charity wards of the hospitals than in private practice. These statistics are sustained by the observations of A. Martin. Dührssen, on the other hand, quotes Roger Williams approvingly to the effect that uterine cancer is not, as was believed, more frequent in the lower classes, but that predisposition to this disease is given by the overfeeding and comfortable position of those in better circumstances. Dührssen further asserts that more women die annually in Germany from carcinoma than there were soldiers killed in the entire Franco-Prussian War, the mortality ranging from 0.5 to 1.0 per thousand; and that all classes alike are susceptible to the disease. The traumatisms of parturition have been looked upon as causes of carcinoma of the uterus; while the frequent observation of commencing cancer at the site of an old laceration, and the well-known tendency of cicatricial tissue to undergo malignant degeneration, have been quoted in support of the theory. Statistical tables bearing upon this point are valueless, in view of the fact that the majority of women are married and have children, and of the additional fact that individual cases are constantly occurring in unmarried and continent women.

The cause of cancer, especially the supposed and probable parasitic origin of the disease, remains a mystery. The scientific world is now

[illegible]

[illegible]

PATHOLOGY OF CARCINOMATA OF THE FALLOPIAN TUBES

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

PATHOLOGY OF CARCINOMATA OF THE OVARY

[illegible] is the most common form [illegible] and has been said to compris[illegible]

[illegible], primary and [illegible] secondary.

Ovarian carcinomata are further considered by Rothrock under two groupings, namely, (a) solid or medullary, and (b) cystic or adenocarcinoma, as follows:

(a) The first group consists of solid tumors. They are of more or less firm consistence, usually rounded or oval in shape, though often irregular in outline, and frequently present a nodular or lobulated appearance. They vary in size—rarely, however, exceeding that of the head of a newborn child. As a rule, they form their attachment by a short thick pedicle, and usually they lie free in the abdominal cavity; only very rarely have tumors been observed which were partially intraligamentary. Not infrequently they are bilateral, though unilateral development is the rule.

They are inclosed in a dense fibrous capsule, and on section present a more or less homogeneous surface of yellowish or gray-white color. Frequently, in softer tumors, the appearance is brain-like. Occasionally the tumor will have a mottled appearance from extravasations of blood into the tumor substance, which, if recent, may be coagulated, or, if of long standing, may appear as an extravasation cyst, simulating those often found in cerebral hemorrhage. Degeneration changes are of common occurrence, especially caseous and fatty changes, with resulting softening and the formation of cyst-like cavities. The contents of such cysts are turbid and of a yellowish color, while their walls present an irregular and uneven outline. Histologically they are composed of a more or less diffuse infiltration of a fibrous stroma with carcinomatous cells. In some instances the fibrous stroma predominates, forming alveoli which are filled with carcinomatous cells. More frequently, however, the microscopic appearance is that of a diffuse infiltration of the rather sparse fibrous stroma, so that the cellular element constitutes the greater part of the tumor, in which case it is termed medullary carcinoma.

(b) The second group consists of cystic tumors which bear a striking resemblance in their external appearance to serous cysts. They are rounded or oval tumors, and rarely exceed in size an adult's head, being usually smaller. They are generally attached by a short pedicle, though they may develop within the ligament, and are frequently adherent to the surrounding viscera. Like serous cysts, they are often bilateral and are usually multilocular, though they may at times appear unilocular.

Papillary growths are observed on the external surface of the cyst in about half the cases. On section the cyst wall is composed of connective tissue, which is often quite friable. Frequently the wall of the cyst is very much thickened in spots from the development in it of carcinomatous nodules. Growing from the internal surface may usually

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] papillary growth [illegible]

Everywhere [illegible] epithelial cells [illegible] papillary growth [illegible] single layer [illegible] The same peculiarity [illegible] papillary growths [illegible] between cystadenoma and the [illegible] of primary carcinoma [illegible] gradual [illegible] impossible to distinguish between them.

Zangemeister [illegible] that no sharp line can be drawn between adenomata which are benign and those which are malignant.

[illegible] according to [illegible] according to his view, [illegible] should be classed as primary carcinoma. The adenoma from which the carcinoma develops he regards as representing an intermediary stage, but at the same time he admits that there is no means of distinguishing it from benign adenoma. Most authors, however, take a middle ground, and regard a considerable number of such tumors as carcinomatous degeneration of primary benign tumors.

The evidence of malignant change consists in a proliferation of the epithelial cells with atypical arrangement, as, for example, instead of the uniform single layer of epithelium are to be seen masses of cells asymmetrical in their arrangement, and tending to form several layers.

The propagation of primary carcinoma by metastasis is of frequent occurrence, tending to involve, first of all, the peritoneum, next the omentum, liver, stomach, intestine, and occasionally the pleura.

Where the disease is unilateral the ovary on the opposite side is frequently the seat of metastasis, and Steffeck has often found it to contain metastatic deposits, when macroscopically it appeared normal. Heinrichs observes also that bilateral development is commonly the result of metastatic involvement from one ovary to the other.

Secondary carcinoma of the ovary is rare, and usually follows carcinoma of the uterus, especially of the body. It has, however, been observed to follow carcinoma of the stomach and mammary gland, the result of metastasis. Like other epithelial neoplasms of the ovary, primary carcinoma may have its origin in the Graafian follicle or in the germinal epithelium.

PATHOLOGY OF CARCINOMATA OF THE URETHRA

Carcinoma of the urethra may be either primary or secondary. In either form it is of only occasional occurrence. Ehrendorfer was able to collect 27 cases from the literature, including one of his own.

The disease occurs in three forms: (1) warty, papillomatous excrescences, developing from the mucosa and projecting from the urethra; (2) thick, nodular, infiltration masses in the periurethral tissues, involving more or less of the circumference of the urethra and usually located toward the external end; and (3) ulcerated surfaces with thickened, irregular, and infiltrated edges. These may begin at any point along the canal, including the meatus. Enlargement of the inguinal lymph glands was recognized and mentioned in only about one-third of Ehrendorfer's cases. As is usual with carcinoma, the majority of the cases occurred late in life.

PATHOLOGY OF CARCINOMATA OF THE BLADDER

Carcinoma is the most common tumor of the bladder. While it occurs most frequently in old age, it may occur at any period of life. Steinmetz collected 32 cases in childhood. There were 14 sarcomata, 13 myxomata, 1 fibromyoma, 1 cystofibroma, 1 rhabdomyoma, and 2 of a nature not stated. The clinical history of the myxomata differed in no way from that of the sarcomata. Concerning the age, there were 23 between one and five years, and only 6 from five to thirteen years. During adolescence and early adult life tumors of the bladder are very rare; after thirty they again increase in frequency, and are most common from forty to sixty.

This form of neoplasm is generally of the papillomatous type, although it sometimes occurs as a fungous growth that at times fills the bladder. Histologically carcinoma of the bladder does not differ ma-

PATHOLOGY OF CARCINOMATA OF THE KIDNEY

Carcinoma of the kidney is a disease of adult life, most common between forty and sixty. It may be either (a) primary or (b) secondary.

Primary carcinoma is more common on the right than on the left side, and more frequent among men than women.

Morris divides cancer of the kidney into two forms: (a) the medullary and (b) the diffused. Other divisions given are: (a) papillary, (b) nodular, circumscribed, or adenomatous, and (c) infiltrating.

The papillary form either begins as such in the pelvis of the kidney, or else occurs as advanced malignant adenocystomata. The nodular or adenomatous cancer may be a degenerative product of simple adenoma, and has its initial development in the cortex. It is rare for the cancer tissue entirely to replace the renal structure, although destruction of a large part of the kidney ordinarily occurs. The margin of the tumor projecting into the parenchyma is smooth, definite, and apparently encapsulated. Sometimes more than one encapsulated mass is found on the kidney.

In the infiltrating form the kidney may be increased in form without modifying its shape. In the later stages the capsule of the kidney may become perforated at different points, through which the disease may appear upon the surface. It may travel in the other direction, extending into the pelvis of the kidney, down the ureter, and even into the bladder. They may vary in size from 1 or 2 cm. to 20 or 25 cm. in diameter.

Some of the larger growths, while smooth upon the surface and apparently solid, are found on section to be cystic.

Metastases may occur to the intestines, stomach, and spleen.

PATHOLOGY OF CARCINOMATA OF THE RECTUM

Carcinoma of the rectum is common in middle life, less so in old age, and rarer still in childhood.

The prognosis is, as a rule, bad, few living more than a year after the disease is recognized. In exceptional cases, however, patients may live two, three, and even four years. The younger the person the sooner death will ensue.

Carcinomatous growths of the rectum develop principally from glandular tissue, and are grouped by Cripps under the one head of adenocarcinoma. Sarcoma is extremely rare in this region, but Grant operated on a case of fibrosarcoma with multiple fistulæ involving the rectum and anus. Carcinomata may manifest themselves as flat tumors in the rectal wall, may project into the lumen of the bowel, or circu scribe the lumen by a nodular band. Because of this difference in the clinical appearance Cooper and Edwards have described them as lam nar, tuberous, and annular. Squamous-celled carcinoma (epitheliom is occasionally met with at the mucocutaneous margin.

PATHOLOGY OF CARCINOMATA OF THE BREAST

Carcinoma in its various modified forms, but still carcinoma, is th most frequent of the malignant growths of the female breast. Th modification of type is largely due to the histologic characteristics the structure from which it develops.

For the purposes of diagnosis the following rather natural classific tion is adopted by Bloodgood, viz.:

(1) Adenocarcinoma.
(2) Medullary carcinoma.
(3) Scirrhus.
(4) Cystic carcinoma.

(1) Adenocarcinoma occurs in about 15 per cent., is most fr quently amenable to operation, and yields the largest percentage cures of all cases. (a) It may occur as a circumscribed tumor witho a capsule, but on incision showing trabeculæ of fibrous tissue inclosin round, granular areas, from the center of which, on pressure, sma worm-like bodies suggestive of comedones can be expressed. From th fact this particular subvariety of carcinoma is sometimes called *aden carcinoma comedo.* Microscopically the large round alveoli are fille with epithelium of the same type as that occurring normally in th ducts. These tumors seem indolent in their early stages, but show tendency to infiltrate the skin and to ulcerate. Krompecher has note same atypical variations in the cellular arrangement of these growt that are without clinical significance. The same is true of mixe types, in which this particular subvariety coexists with the scirrhou or medullary forms. The pure type seems to show little te dency to metastasis, while the mixed types are active in metastat propagation.

(b) Adenocarcinoma may start as a small, thinly capsulated tum with narrow bulging lobules, pink and gelatinous, which give a chara teristic appearance to this subvariety of the growth, sometimes call colloid adenocarcinoma. It occurs chiefly in the senile breast, and, li the carcinomata of old age, is prone to become scirrhous. The tumor indolent with a tendency to ulcerate, but not to metastasis.

(c) Adenocarcinomata may be cystic in formation and are classifi as circumscribed and diffuse. Both are equally malignant, and cons quently without other clinical significance. Further differentiations of adenocarcinomata are of interest only to the pure pathologist.

(2) Medullary carcinoma is slightly less frequent than the preceding class. It is a tumor of relatively rapid growth, does not infiltrate, and yields a large percentage of operable cases. It occurs at any period of life from 28 to 65, with relatively greater frequency during the period of lactation. It occurs as a small discrete tumor, without capsule, and is soft and friable, with numerous necrotic areas. The stroma varies, but is never dense. It occurs frequently as a mixed type, with adenocarcinoma comedo and cystic adenocarcinoma, has a hemorrhagic and a sarcomatous type. They are all malignant; all demand operation, the earlier the better; and each has a record of recoveries sufficient to justify interference in the operable period.

(3) Scirrhous carcinoma, or the hard cancer of the breast, occurs at any period from 20 to 75 years of age. It may occur as a small nodule, as a large but circumscribed tumor, and as a large infiltrating mass. The characteristic feature of scirrhus of any form is the gritty sensation which it imparts to the knife or to the palpating finger at the time of exploratory incision. The alveoli of epithelial cells are relatively large, with few necrotic areas, while the trabeculæ show the yellow dots and yellow lines characteristic of scirrhus. These tumors are indolent at first, but may become malignantly active within a year, although the inauguration of such activity may be deferred for a much longer period. The fact that such a tumor has been in existence a number of years only increases the probability that it will become malignantly active and destroy the patient.

(4) Cystic carcinomata are the least frequent of malignant growths of the breast. Their malignancy has at times been doubted, and they have at times been confused with benign cysts of the breast, such as galactocele (q. v.). The essential diagnostic point, according to Bloodgood, is that on exploratory incision a cyst of the breast that contains blood without a papilloma to explain the hemorrhage is cancer.

SYMPTOMS AND DIAGNOSIS OF CARCINOMATA

SYMPTOMS AND DIAGNOSIS OF CARCINOMATA OF THE VULVA

Carcinoma of the vulva ordinarily begins as a small subcutaneous nodule that speedily involves the skin. Other nodules promptly form and coalesce with the original one, forming a single mass. Cutaneous ulcerations are liable to appear at any time. The vaginal lymphatics may become involved and nodular, and those in the groin become indurated. The cutaneous ulceration spreads rapidly. Long before this stage is reached—indeed, as soon as a growing tumor is observed—a piece of tissue should be removed and a positive pathologic diagnosis should be made.

SYMPTOMS AND DIAGNOSIS OF CARCINOMATA OF THE VAGINA

In carcinoma of the vagina the onset is most insidious. A drawing or tightening feeling in the vagina may be the first symptom to attract attention. Pain, if experienced at all in the early stages, is liable to occur at sexual intercourse rather than at any other time. On examination care should be taken to study the case in the light of the general morphology of the disease given on a preceding page. This alone will generally be sufficient for a diagnosis. There is possibility of confusing the case with infection by either the *Spirochæta pallida* (syphilis), the *Bacillus of Ducrey* (chancroid), or the *Bacillus tuberculosis* (tuberculosis). The description of chancre, chancroid and of tuberculosis infection already given will clear up all points of difference. It is to be remembered that in carcinoma of the vagina the fixation and immobilization of the vaginal membrane take place early, and that the inelasticity of the submembranous structures occurs speedily and is pronounced.

SYMPTOMS AND DIAGNOSIS OF CARCINOMATA UTERI

The disease is generally insidious in onset, and its symptoms in the early stages are correspondingly uncertain and indefinite.

Pain is rarely present until after the disease has made considerable progress.

When the disease is located in the cervix the first symptom to arrest the attention of the patient will be a persistent watery discharge, slightly tinged with blood; this may or may not be associated with fetor. A little later the discharge becomes distinctly sanguineous, and, as the disease progresses, irregular and violent hemorrhages occur. The uterus by this time generally becomes more or less painful, particularly if the endometrium is involved, or if there is an upward extension of the disease from the cervix.

The occurrence of hemorrhage at the menopause, or following it, should be regarded with suspicion, and should always be the occasion for a careful local exploration. As these cases present themselves to the surgeon the diagnosis is generally obvious in cases of carcinoma involving the cervix. The finger will at once detect an enlargement of that segment of the womb; if in the earlier stages the tissues will seem nodular and indurated; if in the late stages, after disintegration sets in, the surface will be irregularly granular and friable, bleeding upon the slightest touch.

At this stage, to the experienced surgeon, the odor of the discharges is so characteristic that a diagnosis is made, as a rule, before the examination is begun. In cases of carcinoma involving the corpus uteri diagnosis will be based, first, upon their rarity, and, next, upon the microscopic examination of some of the tissue removed.

In all cases of suspected cancer of the uterus, when the disease is not so advanced that the diagnosis practically declares itself, a microscopic examination should be made of a piece of tissue removed from the diseased area. This is especially true when the disease is in its incipiency, manifesting itself by either an indurated nodule or a circumscribed erosion of the cervix.

It is not important, from a practical point of view, to distinguish between carcinoma and sarcoma of the uterus, as the treatment is precisely the same in either case.

Carcinoma may occur in a myomatous uterus; while myomata themselves are liable to undergo malignant degeneration—especially of the sarcomatous type. The coexistence of various benign and malignant neoplasms in the same uterus, while not frequent, is occasionally encountered. The coexistence of sarcoma, carcinoma, myoma, and polypus is reported by Neibergal. In cases in which carcinoma or other malignant neoplasms have begun to disintegrate mixed infections of the endometrium speedily ensue.

Pregnancy as a complication of carcinoma of the uterus is occasionally encountered. It is always a serious complication, and one that is a menace alike to the life of the fetus and of the mother. An interesting series of one hundred and sixty-six cases of cancer of the uterus, occurring between 1886 and 1895, has been compiled by George H. Noble, of Atlanta, Ga. The compilation is one which precludes the possibility of normal delivery, even should pregnancy go to term, while abortion is likely to prove fatal. I have published a case in which amputation of the cervix for carcinoma had been done by another operator in the presence of unsuspected pregnancy, and in which the patient was permitted to go to term; when labor began the cervix was found to be distinctly carcinomatous—a condition which, in the absence of necessary surgical aid, speedily resulted in the death of both mother and child.

Carcinoma of the uterus left to itself means inevitable death.

The average duration of life when the disease follows a natural course is from twelve to eighteen months. In cases in which disease is too advanced for radical operation the conservative treatment by curettement stops hemorrhage and waste and prolongs life. course, only defers for a time the inevitable termination.

SYMPTOMS AND DIAGNOSIS OF CARCINOMATA OF THE FALL TUBE

This condition cannot be said to have a symptomatology of When recognized at all it is generally at the time of an operation undertaken for some other purpose. I know of no record in which the disease advanced until it demanded inter because of the symptoms that it induced.

SYMPTOMS AND DIAGNOSIS OF CARCINOMATA OF THE O

Pain is a conspicuous symptom of medullary carcinoma ovary; it is less pronounced when the growth is cystic. But nothing characteristic in the pain whereby it may be disting for instance, from that of a dermoid cyst. As compared with be however, carcinomata are of more rapid growth, although they in size less rapidly than the more familiar proliferating cysts occurrence of an ovarian tumor in connection with primary car of the uterus or some other organ having a metastatic highway ovary increases the probability of malignancy. The positive di in either primary or secondary cases can be made only by expl incision.

SYMPTOMS AND DIAGNOSIS OF CARCINOMATA OF THE URI

The symptoms and diagnosis are of such importance as to d the earliest possible attention. In primary cases attention wil erally be called to the condition by a sense of itching and irritation the meatus or vulva, due to the irritating acrid discharge con present, and pain or smarting on urinating. The presence of symptoms should always lead to an examination, when, on insp and palpation, one of the above-described conditions, should it will be recognized. It must be distinguished from caruncle, ch chancroid, and lupus (see Infections of the Urethra). As th ease is accessible, a small section of the tumor may be removed cocain and examined microscopically, when the positive diagnos be made.

In adults the first symptom is usually hematuria. This is so-called transient variety, appearing and disappearing without c cause, and usually uninfluenced by exercise or exertion. It may la a short time, or persist for months or years, and may be slight or quite severe. For a time there may be no subjective symptoms present; sooner or later, however, increased frequency of urination and pain are noted. These are more marked and appear earlier when the growth occupies the base of the bladder or the region near the internal orifice of the urethra. A pedunculated growth in this region may enter the urethra and make its appearance at the meatus urinarius. This has been particularly noted in children, and has frequently been the first symptom directing attention to the bladder. When the bladder becomes infected, as it is particularly prone to do in malignant cases, the symptoms are those of an ordinary cystitis. In about 25 per cent. of malignant cases the earlier symptoms are those of a simple cystitis. It is impossible to distinguish between a benign and a malignant growth by the symptoms in the early stage, but later the cachexia, loss of flesh, failure of general health, etc., stamp the case as malignant.

Direct inspection of the interior of the bladder through the cystoscope is the only means of making a positive early diagnosis of bladder tumor. By the use of this instrument the extent and the general physical characteristics of the growth may be observed. An infiltrating, ulcerating growth is almost certainly malignant, but in the case of a papilloma it will be difficult to decide, and it is better to await the findings of the microscope before expressing a positive opinion. The duration of a benign growth is often one of years, but a malignant tumor is usually fatal in from one to three years.

The only remaining point of confusion is in the fact that benign and malignant papillomata of the bladder are identical in macroscopic appearance as seen through the cystoscope. In this connection it is important to remember, as pointed out by M. L. Harris, that, as both the entoderm and the mesoderm enter into the formation of the bladder, nearly all varieties of tumors have been found taking origin from its walls. The benign mature connective-tissue tumors, fibromata, myomata, and lipomata, are very rare, and but few well-marked specimens have been recorded. They have their origin in the submucous and muscular layers.

SYMPTOMS AND DIAGNOSIS OF CARCINOMATA OF THE KIDNEY

The earlier stages of the disease are generally symptomless. Blood in the urine is generally the first occurrence that commands attention. This was the first symptom in 70 per cent. of Israel's cases.

The absence of all tumefaction and pain makes cystoscopic examination important at this time to determine the origin of the hematuria. Renal catheterization may be required and ought to be conclusive, although it is to be remembered that in certain cases the hematuria is intermittent. In the intervals, however, the urinalysis will generally show microscopic blood elements with kidney débris, epithelium, some cases with or without albumin in varying quantity.

In the majority of cases, however, the kidney is enlarged and can be readily palpated. Sometimes it is very movable, while at others it seems anchored. Deep pressure elicits pain and sometimes provokes additional hemorrhage. There may be a tumor of considerable size without it being detected by even careful examination. As the cases advance the local and constitutional disturbances increase; the decline in health, strength, and flesh becomes more rapid.

In cases of persistent hematuria, in which the bladder has been excluded as the source of the hemorrhage, and in which ureteral catheterization has shown that the disease comes from higher up, surgical exploration of the kidney is not only justified, but is the only means by which a positive diagnosis may be made in safe season (see Procedure for Surgical Exploration of the Kidney under Injuries of the Kidney).

SYMPTOMS AND DIAGNOSIS OF CARCINOMATA OF THE RECTUM

Sensations of uneasiness, weight, and fullness in the bowel are practically the only symptoms complained of in the early stages of cancer of the rectum. When the tumor grows to considerable proportions and breaks down, leaving a large ulcerated area, the following symptoms will be present:

(1) Irregular or constant pains in the rectum, neighboring organs, and back of and down the limbs; (2) typical cachectic waxy complexion; (3) tape or ribbon-like stools; (4) prolonged straining and a never-ending desire to empty the bowel; (5) abundant discharges of blood, pus, and mucus; (6) loss of flesh; (7) because of increased peristalsis, food is rushed through the alimentary canal undigested; (8) constipation intermitting with diarrhea; (9) low form of peritonitis; (10) obstruction, partial or complete; (11) pain when the growth is on the verge of the anus; (12) in most cases partial or complete incontinence. A small tumor gradually growing, increasing in sensitiveness, and diminishing in mobility should be looked upon as carcinomatous, and removed without waiting for further symptoms.

SYMPTOMS AND DIAGNOSIS OF CARCINOMATA OF THE BREAST

The symptoms and diagnosis consist in and depend upon the physical characters and clinical manifestations that have just been outlined in the preceding description. Recapitulation under this caption is unnecessary. It is, however, important to state that any nodule in the breast is to be looked upon with suspicion, and ought to be explored and examined microscopically for positive diagnosis. The mere fact that a growth has been indolent for a long time is no criterion of benignity. On the other hand, its very age should make it an object of suspicion and apprehension. This is especially true if the growth is associated with retraction of the nipple, or with anchorage of the skin over the nodule.

140. PROCEDURE FOR SURGICAL EXPLORATION OF MAMMARY NEOPLASM

This should be taken, if possible, in a well-appointed hospital with a clinical laboratory, the equipment of which includes a freezing microtome and microscopic equipment. Preparations should be made to extend the procedure into a radical operation at once if the findings are positive.

(1) The patient is anesthetized, preferably with nitrous-oxid-oxygen.

(2) An incision is made on a line pointing directly to the nipple. This is important, to avoid unnecessary wounding of the ducts and the consequent later development of a galactocele.

(3) The exposed nodule is seized with volsella, drawn up to the cutaneous opening, enucleated with the scissors, and handed to the microscopist.

(4) The microscopist immediately makes a frozen section with hematoxalin-eosin stain, and examines it with a miscroscope mounted, if need be, in the operating room.

(5) If the histologic characteristics indicated above are found, or if other evidences of malignancy, such as in sarcoma, are found, the radical operation should be proceeded with at once.

TREATMENT OF CARCINOMATA

TREATMENT OF CARCINOMA OF THE VULVA

From a vulval focus of origin the disease spreads so rapidly by both contiguity and metastasis that treatment seems to be of but little avail. In view of the failure of surgical measures to stay the progress of the disease, and in view of the satisfactory results in certain cases by radiographic measures, it is advisable to recommend early cases for X-ray treatment. It is worthless in advanced cases. Excision of the vulva has been known to stay the ravages of the disease for variable periods.

No detailed procedure can be prescribed.

TREATMENT OF CARCINOMA OF THE VAGINA

Carcinoma of the vagina, when primary, and when more or l diffuse, but not involving the deeper structures or the neighbori lymphatics, justifies the effort to extirpate the vagina. This can done from above or from below. When done from above, i. e., by t abdominal route, the procedure involves the extirpation of the uter It is by all means the easier operation, as I have found in three ca in which the upper zone of the vagina was involved with the cervix.

141. PROCEDURE FOR EXTIRPATION OF THE VAGINA BY TH ABDOMINAL ROUTE (ABDOMINAL HYSTEROVAGINECTOMY)

(1) The abdomen is opened in the median line, the uterus sei with either traction forceps or lateral clamps, the broad ligaments a clamped and cut, and the uterus brought up (see **Procedure for Pa** hysterectomy).

(2) The dissection is carried down (up) between the uterus a bladder, the uterine vessels are ligated, the ureters pushed aside.

(3) With increased traction on the uterus the vagina is dra into the field and separated, with the finger wrapped in gauze, fro its connections with the bladder in front, the rectum behind, and th cellular tissue at the sides. It is sometimes necessary to cut connecti tissue bands. This dissection can generally be made to embrace th upper two-thirds of the vagina.

(4) The vagina is now cut off as far down as possible, care bein taken to secure the margin of the distal end with forceps before th separation is completed.

(5) The upper or cut margin of the lower segment of the vagin is now secured by two or three T forceps introduced through the vulv orifice.

(6) All bleeding points are secured by ligature, the pelvic per toneum sutured, and the abdominal incision closed.

(7) The broad ligaments are split and all glandular and connectiv tissue elements cleaned out (see **Procedure for Panhysterectomy fo** **Carcinoma of the Uterus**).

(8) The lower segment of the vagina is now everted by tractio on the T forceps, and dissected away from its circumferential relation

(9) The vaginal space is now packed with sterile gauze to contr any remaining oozing. This is removed on the third or fourth da and a tube inserted. As soon as serous or other drainage ceases th tube is removed, after which the wound heals without further atten tion.

This procedure, which is but an extension of the Wertheim operation, brings the extirpation of the vagina within the range of practicability. All of my three cases made primary recoveries, but, as all were more or less advanced cases of cervical carcinoma with involvement of the iliac glands, the disease recurred in each instance.

142. PROCEDURE FOR EXTIRPATION OF THE VAGINA AND UTERUS FROM BELOW (VAGINAL HYSTEROVAGINECTOMY)

Extirpation of the vagina is sometimes practiced in cases of primary carcinoma or of tuberculosis of that canal. Very satisfactory reports of the operation have been made by Olshausen, Dührssen, Martin of Berlin, and others.

(1) In the performance of this operation it may be necessary, as a preliminary step, in cases of narrow or indurated vaginæ, to incise the perineum, or even to carry the incision entirely through the perineum, round the anus, and up to the coccyx.

(2) As a rule, however, the operation may be done, as Martin directs, by making a preliminary incision round the hymenal ring at the introitus vaginæ.

(3) After this has been done but little difficulty is experienced in enucleating the vagina by means of the finger, separating the entire canal from its underlying connective tissue clear to its juncture with the cervix.

(4) If the disease has not gone beneath the mucous membrane the resulting disturbance of the blood vessels will not be so marked as to occasion serious difficulty in controlling the hemorrhage. If, however, the incision must be made through the perineum, round the rectum, and up to the coccyx, the hemorrhage from the hemorrhoidal plexus may be controlled only with some difficulty.

(5) After the vagina has been enucleated in the manner indicated the remainder of the operation consists in the removal of the uterus and adnexa (see Vaginal Hysterectomy).

The proposition has been made by P. Müller in senile cases to extirpate the vagina, leaving the uterus *in situ;* but, as even the senile uterus is the source of some secretion which will accumulate above the tract of the vagina, which now becomes occluded, it is essential that even in these cases the uterus should be removed. Partial extirpation of the vagina has been practiced by Fritsch and Asch, but the results have not been satisfactory. The method of Martin, as before described, is probably the safer, the operation being concluded by drawing down the peritoneum and stitching it all round at the introitus. After this step has been taken the vulvar orifice closes itself by transverse obliteration.

This operation is technically more difficult than the preceding, i. e., abdominal hysterovaginectomy, and has the crowning disadvantage of leaving the lymphatic plexus in the broad ligament.

Palliative treatment of carcinoma of the external genitalia is mentioned after attempted radical treatment, because that is the chronological order in which it should be adopted. It consists in making the patient as comfortable as possible during the persistence of the disease, and should be adopted as a line of practice only in cases that are either awaiting operation or that have ceased to be suited to it in consequence of the extension of the disease. Of the latter class may be mentioned as examples carcinoma of the vagina invading and penetrating the rectovaginal septum, thereby causing a rectovaginal fistula, or other cases, again, in which the disease has perforated the bladder. These are distinctly hopeless conditions, entirely beyond the reach of surgical art, their comfort, or the little that may be secured for them, depending on various palliative measures. Cleanliness is of the first consideration; douches of lysol or creolin are cleansing, antiseptic, and are better borne than the more irritating solutions of either carbolic acid or the mercuric bichlorid. Excoriated surfaces may be dressed with sterilized white vaselin or other oleaginous product, a little lysol or creolin being incorporated with this agent if desired. Opiates in the form of rectal suppositories or hypodermic injections of morphin should be given whenever they are not contraindicated by the idiosyncrasy of the patient. These are cases for euthanasia.

TREATMENT OF CARCINOMA OF THE UTERUS

The treatment of uterine carcinoma may be considered as (a) palliative and (b) radical.

(a) Palliative Treatment.—Palliative treatment is mentioned with some hesitancy only because in early cases it may be accepted as a placebo to beguile the patient into a fatal delay. I wish, therefore, to be emphatic in the statement that, so far as the course of the disease is concerned, there is no palliative treatment, and that "palliation" used in this connection relates only to the comfort and general welfare of the patient in the presence of what, in the absence of early radical treatment, is a persistently progressive and aggressive disease.

Cases of reputed cure of cancer of the uterus by palliative or so-called "conservative methods" are always to be looked upon with dis-trust. A quarter of a century ago, when the microscope was not in extensive use, cases of ulceration of the cervix one centimeter or more in diameter were encountered, which were looked upon as ulcers, chancres, or beginning cancers. It was the custom to treat such cases with lunar caustic, nitric acid, etc., making an application once in four or five days. Carstens has observed cases in which this treatment has been followed by perfect healing, though the disease was certainly not syphilitic. Hence the condition must have been benign or the beginning of a malignant growth. On the contrary, in some cases thus treated the patients were apparently cured, but died a year or two later of cancer. It may be possible that those patients who recovered permanently had a non-malignant ulcer; while those who developed cancer in a year or two had ulcers that were cancerous in the first place, but, by the application of caustic, the removal of the neoplastic formation, and the stimulation of healthy granulation, the parts healed, although in the deeper structures cancer cells remained, which continued to develop and involve the whole womb and the surrounding structures. In more advanced cases the cervix was removed and then cauterized with chromic acid, pure bromin, mercuric nitrate, zinc chlorid, etc. The various pastes and plasters, used even to-day by quacks who call themselves cancer doctors, have long been discarded. The basis of all these plasters and pastes has been either arsenic, lime, or zinc. Any of these preparations placed in quantity on soft tissues will destroy them in various directions and in a most irregular manner that can not be controlled.

Palliative treatment alone is available when the uterus is fixed, and the broad ligament, base of the bladder, and vagina are involved. In such cases Carstens proceeds as follows: All diseased tissues are thoroughly removed with the knife, scissors, or sharp curette, going over the ground repeatedly, so that the apparently healthy tissues are reached. When working at the base of the bladder or rectum great caution must be exercised to prevent perforation. The hemorrhage may be extensive at first, but, as more healthy tissues are reached, the hemorrhage ceases, unless the circular or uterine arteries, which may require the application of a ligature or the forceps, are opened.

Sims' method was to apply iron perchlorid to this large raw surface to stop the hemorrhage, removing it in twenty-four hours, and then applying caustic; but, as caustic is the best hemostatic, Carstens always applies it at once as follows: A piece of absorbent cotton, of a size and shape to suit the cavity and made round or long according to indications, is attached to a string. This is dipped in a solution of zinc chlorid, one ounce to half an ounce of water. It is then squeezed as dry as possible, care being taken to dry the fingers immediately to prevent damage to them, or, still better, to conduct the whole operation with rubber gloves. Having again dried the cavity, the cotton is carefully placed so that it comes thoroughly in contact with all the raw surface. If it is not dry enough it will run down the vagina and cause trouble. To prevent this accident Sims suggested filling the vagina with absorbent cotton and saturating it with sodium bicarbonate, which would immediately neutralize the zinc; but this method is improved upon by Carstens, who takes a ball of dry absorbent cotton large enough to fill the vagina, to which also a string is attached, and packs it into the vagina. The upper part catches any little discharge of the chlorid of zinc, minimizing its caustic action and limiting it to the upper part of the vagina. In the string attached to the cotton containing the chlorid of zinc one knot is tied. In that attached to the dry cotton two knots are tied, in order to distinguish them and to indicate in which order to remove them. This packing is allowed to remain for forty-eight hours, when it is removed and vaginal douches used. The slough that is formed by the caustic comes away in about ten days, often in one large piece, leaving beneath it a clean granulating surface, which rapidly contracts, and frequently entirely closes, except the small fistulous opening through which menstruation can take place.

It is astonishing how quickly women will recover and gain strength after this procedure; the discharge ceases, the appetite improves, and the patient gains in weight twenty or thirty pounds in three months. In the course of time, however, recurrence takes place, sometimes within six months, sometimes not for a year or more. If the case is carefully watched the foregoing procedure can be repeated at once on recurrence, and, if taken very early, the small point where recurrence takes place can be easily curetted and cauterized without the use of an anesthetic.

Curettage, considered as a palliative measure in advanced cases, is an expedient in favor with many operators. With the patient under an anesthetic the diseased parts may be scraped thoroughly with a Récamier or other sharp curette, with the Simon scoop, or with the Thomas spoon-saw. The scraping should be followed by daily vaginal injections with antiseptic solutions.

High amputation of the cervix as a palliative measure is indicated in cases in which the disease has gone beyond the uterus, and where the discharge is so disagreeable and the hemorrhage so extensive as to make life a burden. With the brilliant results of to-day achieved by the complete removal of the uterus, so-called "high amputation" is practiced but rarely, and should never be employed when the organ is removable by the Wertheim procedure (q. v.).

143. PROCEDURE FOR HIGH AMPUTATION OF THE CERVIX FOR CONTROL OF PERSISTENT HEMORRHAGE

(1) The patient, under the influence of an anesthetic, is placed on her back with her buttocks on the edge of the operating table.

(2) After the vagina has been thoroughly cleansed a retractor is inserted.

(3) The diseased parts are grasped with volsella forceps and the cauliflower growth removed with scissors, after which the vagina is again cleansed.

(4) Then, with a two or three-pronged volsella forceps, the cervix is seized more firmly.

(5) An incision is made all round the uterus at the junction of the mucous membrane of the vagina and of the cervix.

(6) The vaginal mucous membrane is next pushed back with the fingers, or with a blunt dissector, for a quarter of an inch or so, and a conical piece removed from the uterus. The apex of this cone corresponds to the uterine canal.

(7) The hemorrhage is quite profuse when the circular artery is cut, and will require ligation of the vessel. Sometimes a simple twisting of the artery will be sufficient, but this measure is not trustworthy.

144. SECOND PROCEDURE FOR HIGH AMPUTATION OF THE CERVIX

(1) Draw the uterus down with traction forceps; insert a catheter to the lower vesicocervical fold as a guide, and make a transverse incision the width of the cervix (Fig. 317).

(2) Carry the transverse incision entirely around the cervix.

(3) Separate the cervix from the bladder in front, from the vaginal septum posteriorly, and from the cellular tissue laterally by blunt dissection.

(4) If the uterine arteries are exposed they should be seized and be either tied at once or held to be tied after the cervix has been cut away.

(5) The cervix is cut away (Fig. 318).

(6) If the uterine arteries have not been exposed and seized in the course of the dissection they are now controlled by deep *en masse* ligature (Fig. 319).

(7) An interrupted suture is now placed in either angle of the vaginal incision, the cavity formed by the removal of the cervix is packed, and the patient put to bed.

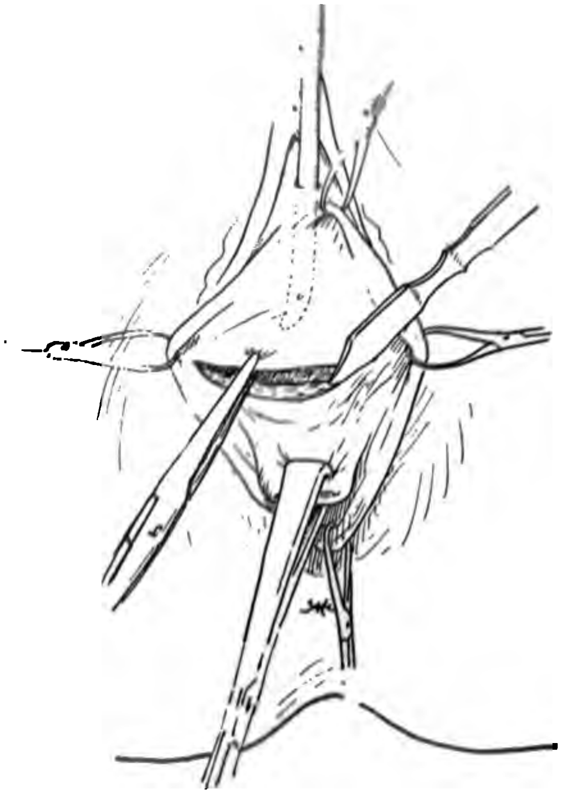


Fig. 317.—(144) Second Procedure for High Amputation of the Cervix. (a) The anterior inci-

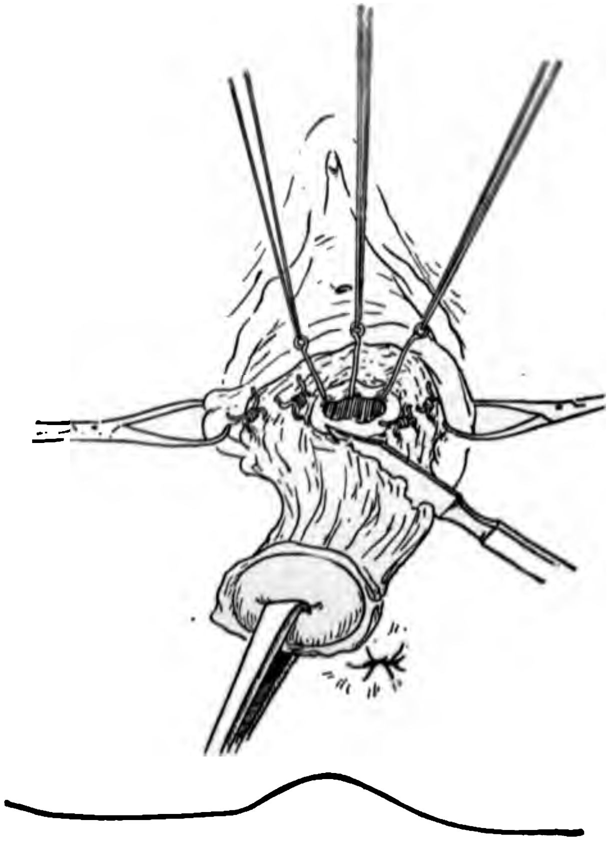


Fig. 318.—(144) Second Procedure for High Amputation of the Cervix.

(8) The cavity thus produced can be packed with antiseptic gauze, but it is better to treat it with zinc chlorid, as before mentioned.

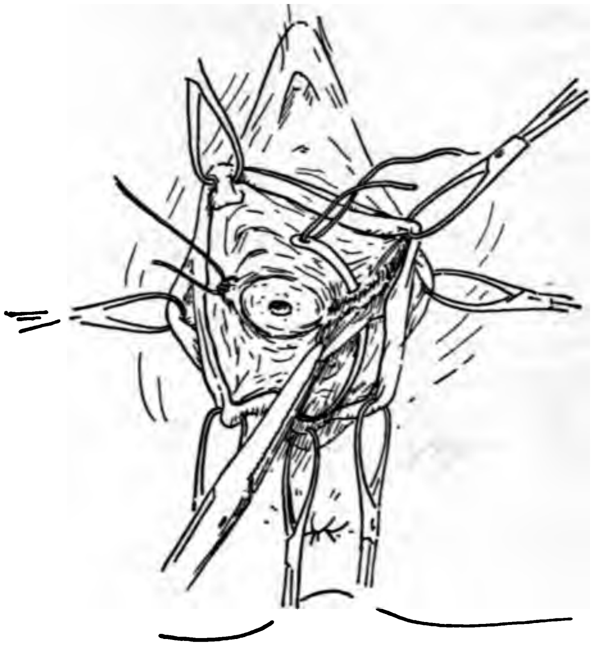


FIG. 319.—(144) SECOND PROCEDURE FOR HIGH AMPUTATION OF THE CERVIX. (c) The closure of the vaginal vault by continuous laminated suture.

145. BYRNE PROCEDURE OF IGNOHYSTERECTOMY

Skene describes this procedure in the following words:

(1) A diverging volsella, after being passed well into the cervical canal, should be expanded to a proper degree and locked, so as to afford complete control of the uterus during the entire operation. By alternate traction and upward pressure of the uterus an accurate idea may be obtained as to the proper point to begin the circular incision, so as to avoid injuring the bladder or opening into the cul-de-sac of Douglas. As to the latter, however, should it be found that the disease has involved the retrouterine tissues, and that its excision or destruction by the cautery can not be effected without opening into the peritoneal cavity, there need be no hesitation in doing so. I have never known any harm to come from it, whether it was done accidentally or by design. Should it be evident at the outset that the operation, in order to be thorough, must include a portion of the cul-de-sac, it will

be better to make the line of incision anterior to this, until the ce vix has been removed, and leave the incision of the retrouterine par by the cautery knife to be the final proceeding. Under these circur stances all that will be needed will be an antiseptic tampon proper applied.

(2) In proceeding to make the circular incision the cautery knil slightly curved *and cold*, should be applied close up to the vagin junction, and from the mome the current is turned on should kept in contact with the parts l ing excised.

(3) Before removing the el trode for any purpose such change of position, or alteri the curve of the knife, the curre should first be stopped and the i strument again placed into po tion while cool before resuming t incision. In other words, if t knife, though heated only to a d red, be applied to parts at all v cular, more or less hemorrha will follow; whereas, the cool pla num blade being already in cont with moisture as the current is l ing transformed into heat, vess are shrunken or closed even bef they are severed. This is a ve important point and should ne be lost sight of in all cautery c erations.

(4) The circular incision ha ing been made to the depth, sa of a quarter of an inch, it w now be observed that by increas traction the uterus may be dra much farther downward, ar by directing the knife upwa and inward, the amputation m be carried to any desired (tent.

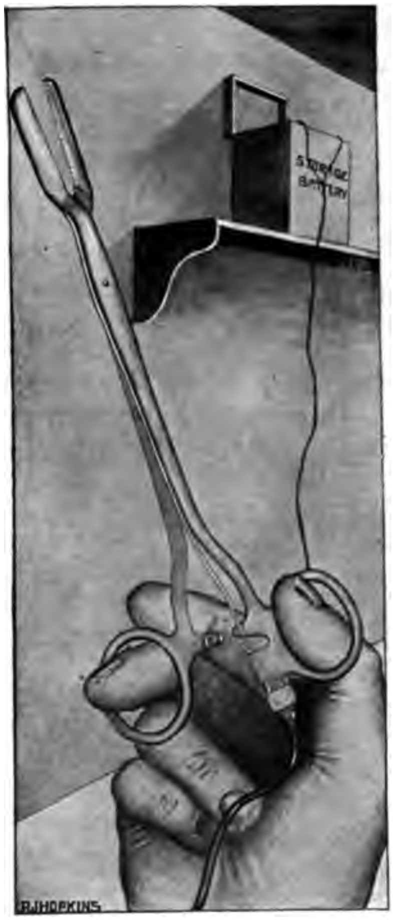


FIG. 320.—THE BYRNE APPARATUS, CONSISTING OF THE ELECTRIC FORCEPS PROPER, CONDUCTING CABLES, AND A STORAGE BATTERY.

(5) In cases calling for amputation above the os internum it w be better to excise and remove the cervix first; then, by dilating t

upper canal sufficiently to admit the diverging volsella, once more proceed as in the first instance, taking care, however, to keep within bounds.

(6) It will be found that the cupped stump can now be drawn down and made to project as a more or less convex body.

(7) In all cases the dome-shaped electrode should be passed over the entire cavity repeatedly, so as to render the cauterization still more complete. It is important to add that, in carrying the knife toward the sides of the cervix, circular and other arterial branches are likely to be encountered, and hence, in this locality particularly, a high degree of heat in the platinum blade is to be carefully avoided.

(8) As an additional security against hemorrhage the convexity of the knife should be pressed against the external surface of each particular section cut, so as to close the vessels more effectually.

It is well to state that the metallic parts of the electrode for the distance of about two inches should be covered with a strip of thin flannel, so that the vagina may be protected from injury through the reflected heat.

This procedure, devised by Byrne, was followed with excellent results at his hands. It was designated by him "high amputation of the cervix." It consists in the removal of the whole uterus except a thin shell at the fundus (Fig. 320A), and is, to all intents and purposes, a hysterectomy, the uterus being cut out by an electric knife, "followed by thorough dry roasting of the remaining excavation." To designate it as "high amputation of the cervix" and to attribute its results to "amputation of the cervix" is to impart the misleading idea that those results have been realized by the removal of merely the lower segment of the uterus.

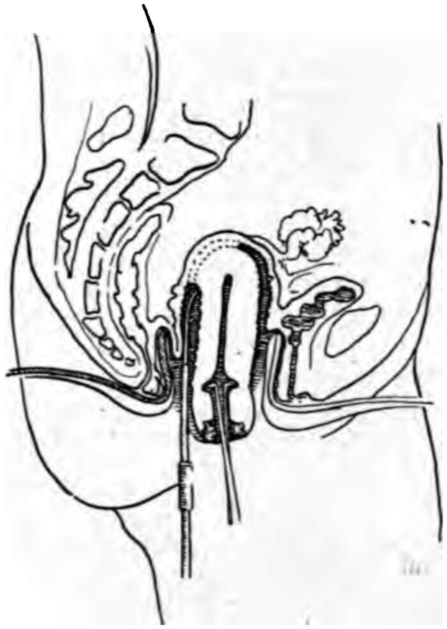


FIG. 320A.—(145) BYRNE PROCEDURE OF IGNOHYSTERECTOMY FOR CARCINOMA OF THE CERVIX. The interior of the uterus is being dissected away with the cautery leaving only a shell.

[illegible] the procedure is that it do [illegible] the extent of the tumor as to possible beginni [illegible] termination.

(b) Radical Treatment.—The radical treatment of carcin [illegible] consists in the extirpation of the diseased organ a [illegible] lymphatic glands when they are involved and [illegible] reasonable suspicion that they may be invo [illegible] has been extended in recent years to include the [illegible] glands from the interior of the pelvis, and to th [illegible] of the vagina. The uterus may be removed [illegible] the vaginal route (*vaginal hysterectomy*), or (b) by [illegible] (*abdominal panhysterectomy*).

[illegible] NEWMAN PROCEDURE OF VAGINAL HYSTERECTO
CARCINOMA OF THE UTERUS

(1) The patient is prepared as is usual for vaginal and [illegible] section, is placed in the lithotomy position with the hips well [illegible] edge of the table.

(2) The posterior vaginal wall is retracted by means o [illegible] self-retaining speculum, exp [illegible] vaginal vault and cervix uteri.

(3) The anterior lip of the cervix is seized with the vol [illegible] cervix and the uterus drawn down. Continuous irrigation with a [illegible] being employed from this point [illegible] peritoneal cavity is opened.

(4) In septic cases (a) the cervical canal should be cure [illegible] swabbed with a [illegible] per cent solution of carbolic acid. (b) [illegible] extensive sloughing of the cervix has occurred it is best to cu [illegible] cauterize it during the preparatory treatment of the precedi [illegible] to eliminate as much débris and septic material as possible [illegible] field of operation.

(5) In all cases curetting and cauterization are followed by [illegible] together of the anterior and posterior lip of the cervix, thus ef [illegible] closing it against leakage from the affected organ. This is acco [illegible] by three or four interrupted sutures of the strongest braided [illegible] ends of which are left long for traction.

(6) A circular incision is made through the mucous mem [illegible] the vagina and carried round the entire cervix. The electric [illegible] or the thermocautery is substituted for the knife or scissors [illegible] operators in making this dissection.

(7) With the index and middle fingers peel up the layer [illegible] connective tissue from in front of and behind the cervix until th

toneum is reached. This can be recognized by the smooth gliding of its surfaces one upon another, and the small fluid accumulations in the cul-de-sac of Douglas.

(8) The peritoneum is seized with tissue or artery forceps, nicked with the scissors, and the finger thrust through into the peritoneal cavity, and the opening extended with the fingers as far as the broad ligament upon either side.

(9) The outer surfaces of the uterus, its adnexa, and surrounding structures are carefully examined, adhesions broken up, and a gauze sponge with tape attached, to which a catch forceps is applied, should be carried up into the peritoneal cavity to protect the parts from infectious material, and prevent the protrusion of omentum and intestine.

(10) The separation of the bladder from the anterior cervical attachments is completed, great care being exercised not to perforate or injure this organ or the ureters situated at the sides and front of the wound in its lower portion. Accident may be avoided by keeping the palmar surface of the dissecting fingers in close apposition to the uterine walls.

(11) The vesicouterine folds of the peritoneal membrane are opened close to their uterine attachment and the fingers inserted, enlarging the opening laterally, pushing the ureters carefully to either side, and completing the separation of the bladder. The uterus will now be found suspended in the pelvis by the broad and round ligaments alone.

(12) With the cervix drawn well to the left, and using lateral retractors to bring the structures well into view, the base of the right broad ligament is seized between the left thumb in front and index finger behind, and the uterine artery palpated. The portion of the ligament containing the artery is now included in the bite of a strong ligament forceps, or a strong silk ligature is applied about a centimeter distant from the uterus with a full curved aneurysm needle and tied firmly.

(13) The structures are now divided with scissors between the clamp or ligature and the uterus, close to that organ.

(14) The base of the left broad ligament, with the uterine artery of that side, is treated in the same way.

(15) Firm traction brings down the uterus for the placing of a second clamp or ligature immediately above the first on either side, and the tissues are incised in the same manner.

(16) Using the finger as a guide, a large blunt hook or the finger is now passed over the top of the broad ligament, one side brought down sufficiently to permit the application of a third clamp or liga-

ture, and the last incision is made, freeing the uterus entirely from its attachments upon that side.

(17) The fundus is drawn down outside the vulva, the clamp or ligature easily applied to the remaining portion of the broad ligament, and the uterus cut away.

The preceding technique, described and practiced by Newman, is modified by himself and other operators in certain cases. At the point where the uterine arteries have been secured by clamp or forceps, and the base of the broad ligament incised, by rotating the uterus forward through the anterior vesicouterine incision, or backward through the posterior cul-de-sac, the fundus can be delivered. As a rule, this is easily accomplished by first pushing the cervix upward and forward, or backward, as the case may be, and then seizing the body of the uterus a little in advance of the cervix with a strong volsella forceps, and drawing it down either anteriorly or posteriorly, as desired. A second forceps then secures the tissues a little higher up, rotating or dragging the fundus still farther downward until it can be grasped and drawn out completely inverted.

The ligation or clamping of the ovarian arteries or the upper portion of the broad ligament now proceeds from above downward, close to the uterus, if the ovaries are to be saved, or beyond both tubes and ovaries along the tuboinfundibular ligament, if they are to be sacrificed.

Careful inspection should now be made of the stumps of the broad ligament, which are gently drawn down for the purpose. If there is any bleeding the insecure clamp or ligature should be readjusted. The vagina is sponged free of clots, and the sponge or sponges removed from the peritoneal cavity. A running catgut suture, which should include peritoneal and vaginal tissue, closes the vaginal vault, and secures the stumps of the broad ligaments in either angle of the wound.

147. PRYOR PROCEDURE OF VAGINAL HYSTERECTOMY BY HEMISECTION OF THE UTERUS

(1) With the patient on her back, a short-bladed perineal retractor inserted, the uterus is drawn down by intrauterine traction forceps (Fig. 321), and the posterior cul-de-sac is opened. The cervix, drawn downward and backward, is separated from the bladder.

(2) A bullet forceps is attached to each side of the cervix and the intrauterine traction forceps removed. The uterus is then forcibly drawn down and split in the median line from cervix to fundus. This is facilitated by a Crile retractor bent to curve above and draw down the fundus.

(3) One-half of the uterus with adnexa is forced up into the pelvis, while the other half of the uterus with adnexa is drawn down and out of the vulvar orifice. The broad ligament of the half thus drawn down is securely ligated, the uterus and adnexa cut away, and the stump permitted to retract. The other half of the uterus with adnexa is then treated in the same way. If ligation is not found expedient clamps may be left on.

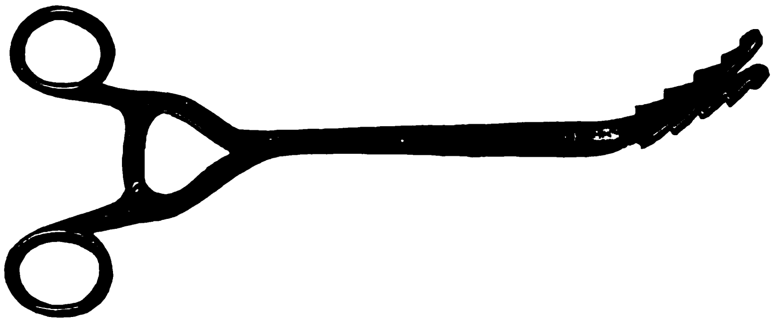


FIG. 321.—PRYOR TRACTION FORCEPS.

(4) The vagina is then packed with parallel strips of iodoform gauze.

This procedure affords a convenient, expeditious, and safe way to remove the uterus and adnexa through the vagina. As a remedy for carcinoma it is open to the objection that the glands in the broad ligaments are left behind, and it ought, therefore, not to be done in this class of cases. If it or any other procedure of hysterectomy by the vaginal route has a field it is rather to be found in infections or small benign neoplasms.

(b) The radical treatment consists in the surgical removal of all infected organs and structures.

The indications for complete abdominal hysterectomy are absolute whenever carcinoma of the uterus exists within operable limits, and whenever the general condition of the patient is such as to make success probable.

When the cancerous uterus is found to be impregnated hysterectomy should be done in the earlier stages of the pregnancy; or, if the woman is permitted to go to term, she should be delivered by Cesarean section or the Porro operation. The Porro operation (abdominal hysterectomy) should be done in the later stages of pregnancy, when there is a prospect of removing all of the malignant structures; the conservative Cesarean operation, according to Noble, "ought to be employed in all cases with obstruction to the birth of the child by extensive exudate, or

where there is not a reasonable hope of eradicating malignancy.
question of operative interference after the period of viabil
been reached is one which can not be settled by any definite
The condition ought to be explained to the family, and especiall
patient, who should be given an opportunity to choose betw
desperate alternatives. The fact should be remembered that
cinomatous uterus may be able to carry a pregnancy to term, a
a living child may be born by either the Cesarean or the Porro
tions. At the same time it should be clearly held in mind
consequence of a pregnancy, a carcinomatous uterus may be s
provoked to violent and fatal hemorrhage. The time for operat
the character of operation should be determined by the surge
the patient in full recognition of the facts.

In elective cases that operation should be selected which of
best prospect of removing all the diseased tissues. All operatio
been directed to this end as far as an understanding of the pa
involved and the known resources of surgery would permit. E
procedure has generally marked a step forward. The evolut
gone on until it seems to have reached its culmination in the pr
of Wertheim.

148. WERTHEIM PROCEDURE OF ABDOMINAL PANHYSTERE FOR CARCINOMA OF THE UTERUS

(1) The patient, anesthetized, is placed in the Trendelenb
sition and the abdomen opened in the median line from near th

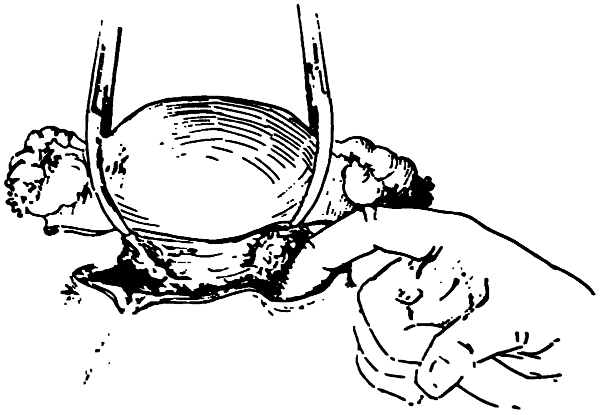


FIG. 322. (148) WERTHEIM PROCEDURE FOR COMPLETE EXTIRPATI
THE UTERUS AND PELVIC LYMPHATICS FOR CARCINOMA. (a) The
ian arteries have been ligated, the uterus drawn up by forceps, th
toneum incised and blunt dissection within the broad ligament comme

to near or, in fat subjects, above the umbilicus; the uterus is seized with traction forceps and drawn into the field of operation.

(2) (a) The ovarian vessels are ligated at the juncture of the ovaricopelvic ligament with the pelvic wall, care being taken not to include the ureter, which is superficial at this point (Fig. 322). (b) The ovarian vessels are further controlled by being clamped with Kocher forceps at the uterine end of the broad ligament.

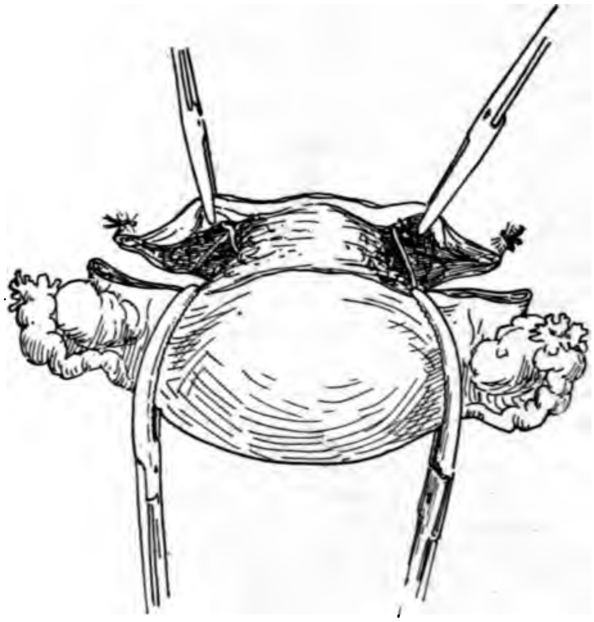


FIG. 323.—(148) WERTHEIM PROCEDURE FOR COMPLETE EXTIRPATION OF THE UTERUS AND PELVIC LYMPHATICS FOR CARCINOMA. (b) The uterine arteries have been exposed and the uterine artery on the right has been ligated.

(3) The ovaricopelvic ligaments are divided between the ligature and the pelvic wall (Fig. 323).

(4) A mass ligature is passed around each round ligament and Fallopian tube near the uterus and cut long (Fig. 324).

(5) The uterus is dissected away from the bladder and then away from the vaginal septum (Fig. 325), gauze being used for the purpose after the incision in the peritoneum has been made.

(6) (a) The leaflets of the broad ligament are now drawn open; (b) the ureters identified at their crossing with the uterine vessels are isolated on an aneurysm needle; (c) the uterine vessels are ligated.

(7) The ureter is now lifted up on the aneurysm needle and dissected free for about 3 cm.

(8) (a) The fundus of the uterus is now drawn toward the pubes, (b) away from the rectum, and (c) the uterosacral ligaments are divided.

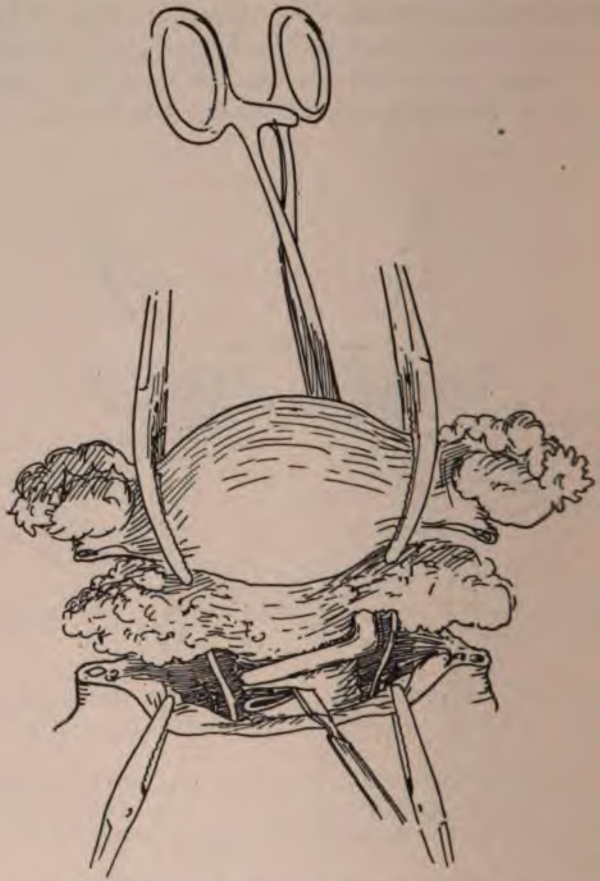


FIG. 324.—(148) WERTHEIM PROCEDURE FOR COMPLETE EXTIRPATION OF THE UTERUS AND PELVIC LYMPHATICS FOR CARCINOMA. (c) The glandular tissue having been dissected out of both broad ligaments, and the dissection having been carried down below the cervix, the vagina is clamped to keep all cancerous elements within, and then cut across below the clamp.

(9) (a) The leaflets of the broad ligament are now drawn widely apart with hemostatic forceps, (b) the gangliocellular mass contained in each broad ligament is seized with a clamp, drawn up, and dissected out with gauze (Fig. 324).

(10) (a) The uterus is now placed on increased tension; (b) the bladder is dissected further back with gauze; (c) the dissection around the vagina is carried to a point beyond the zone of probable infection;

(d) an L clamp is placed on the vagina at this point; (e) the uterus with adnexa, including the gangliocellular tissue at either side, is removed by cutting across the vagina with a knife or cautery, and (f) the cut margins of the vaginal wall are secured by forceps as cut.

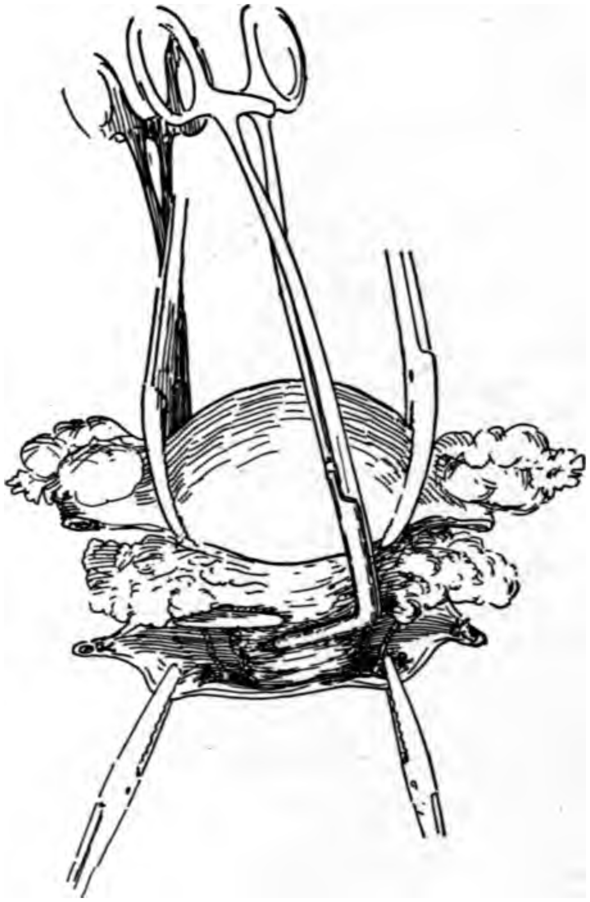


FIG. 325.—(148) WERTHEIM PROCEDURE FOR COMPLETE EXTIRPATION OF THE UTERUS AND PELVIC LYMPHATICS FOR CARCINOMA. (d) Two smaller clamps have sometimes been found more convenient by the author.

(11) The intraligamentary space is now carefully inspected and any remaining deposits of glandular or cellular tissue removed.

(12) (a) After making sure of complete hemostasis (b) the peritoneum is closed, and (c) the operation is completed by usual closure of the abdominal incision.

Drainage is not employed unless there is strong probability of infection. It is best done by carrying a gauze drain down throug vagina.

In certain cases of panhysterectomy done after the method ind by Fig. 326 for a presumably nonmalignant condition, the revel of the operation may indicate the importance of extending it to em the enucleation of the pelvic glands. This, under the circumst can be very readily done after the manner indicated in Fig. 327. It is to be remembered, however, that the preliminary extirpation of the uterus is always undesirable, as the manipulation of this organ when the seat of malignant disease is liable to force the infectious element out into the lymphatics.

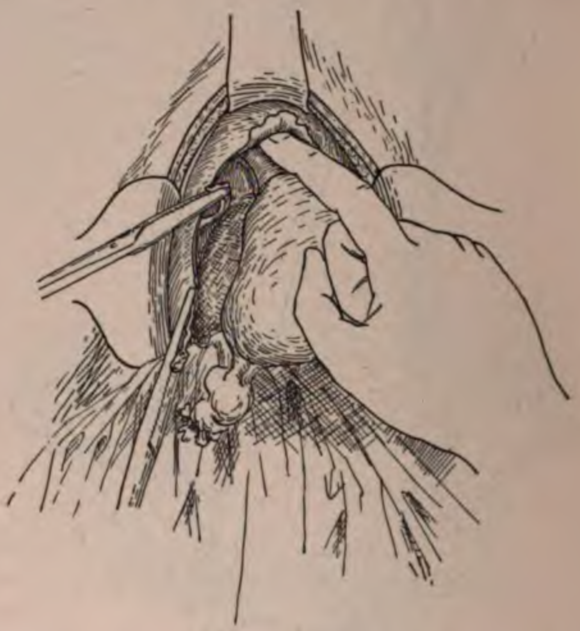


FIG. 326.—IMPROPER METHOD OF ENUCLEATING THE CERVIX AFTER DIVIDING ITS LYMPHATIC CONNECTIONS ON EITHER SIDE.

In the course of Wertheim's operation, the bladder may be wounded. Schauta, quoted by Berkeley and Bonney, reports 11 injuries of this sort; Döderlein, 61 times in 1,979 cases by 90 operators; Olshausen, 22 times in 638 cases; Berkeley and Bonney found 15 injuries to the bladder in 291 British cases collected by them, and report 19 such injuries in 157 cases at Johns Hopkins Hospital. Injury of the ureter has occurred at the hands of most experienced operators. This seems to have occurred largely from the use of the clamp in closing the vagina. As the use of the clamp in closing the vagina is totally unnecessary, the same thing being accomplished by ligature, the accident from this cause can be eliminated from the hazards of the operation.

In this day of surgical advance the procedure of Wertheim is the only one that is entitled to first consideration. It is addressed intelligently to the removal of the actual and probable pathology, and thus offers the best ultimate prospects to the patient.

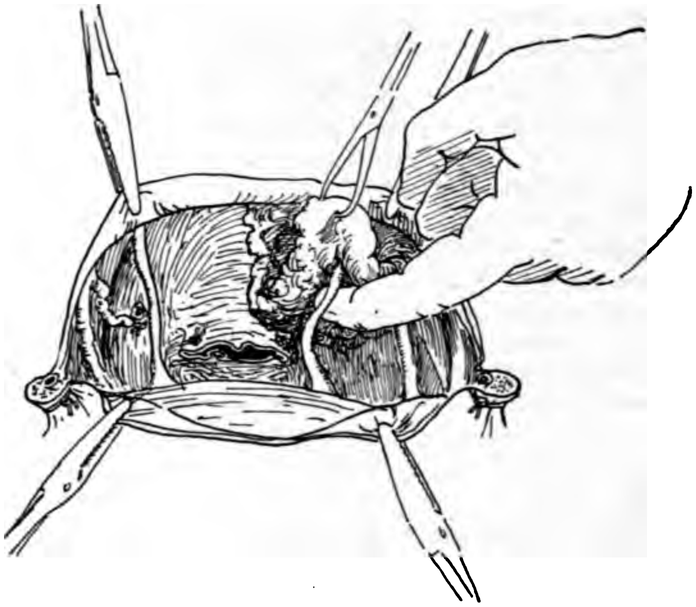


FIG. 327.—IMPROPER PROCEDURE FOR ENUCLEATING THE PELVIC LYMPHATICS AFTER THE UTERUS HAS BEEN REMOVED, THE VERY POINT TO BE AVOIDED IN THE WERTHEIM PROCEDURE.

The primary mortality in the hands of Wertheim is as low as 7 per cent. in a late series of 30 cases. His earlier work showed a much higher mortality. This discrepancy, even at Wertheim's hands, shows the importance of having this complicated operation done by experienced gynecologists. In 243 British cases by different operators the primary mortality was 18.1 per cent. Döderlein's list of 715 operations gave a mortality of 14.8 per cent., his own primary mortality being 18.7 per cent. Bumm's early mortality was 25 per cent., but with experience it has come down to 15 per cent. These mortalities are higher than those from ordinary hysterectomy in carcinoma cases, but it must be remembered that they have given a compensatory security to survivors. Not one-tenth of vaginal hysterectomy cases are alive after five years.

In the hands of Wertheim the percentage of ultimate cures is very high. He has 138 women alive five years after operation, which equals 62 per cent.; Polsson, 60 per cent.; and Mackenrodt, 45 per cent.

TREATMENT OF CARCINOMA OF THE FALLOPIAN TUBES

This condition, when found, should be treated by removal of the Fallopian tubes and of the lymphatics beneath the broad ligament of the affected side.

TREATMENT OF CARCINOMA OF THE OVARY

The treatment is exclusively surgical. So far as the extraabdominal characteristics are concerned, the possibility of any tumor of the ovary being carcinomatous, and the 15:100 chance that it is carcinomatous, establish a conclusive reason why exploratory incision with reference to a complete operation should be undertaken in all cases as soon as it is established that an ovarian tumor exists.

TREATMENT OF CARCINOMA OF THE URETHRA

All so-called palliative treatment is merely aggravative treatment. The possible exception is when the disease is external, near to or involving the meatus, and with no metastatic manifestations. In such cases radiographic treatment may be employed with success, which, however, cannot be assumed in advance in each case. The safer treatment is probably by complete extirpation of the urethra.

149. PROCEDURE FOR EXTIRPATION OF THE URETHRA FOR CARCINOMA (URETHRECTOMY)

(1) The urethra with its lymphatics, surrounding cellular tissue, and vaginal membrane is temporarily but firmly ligated just at its connection with the bladder. This is done by passing a deep *en masse* ligature of silk 5 mm. from one side of the urethra, through the vaginal membrane down to the pubes, out at a corresponding point on the opposite side, tying it firmly and leaving the ends long.

(2) A semicircular incision 2 to 3 cm. long is made convexly to the urethra midway between the meatus and the pubes, and the urethra dissected away from the bone, back to the level of the temporary ligature.

(3) The flap thus formed is divided with scissors first on one side and next on the other side of the urethra, the two lines of division being brought together in the mucous membrane just above the temporary ligature, at which point the urethra is cut across and removed (Fig. 328).

(4) The temporary ligature is removed, all bleeding controlled by ligature, and a No. 10 urethral sound is introduced into the bladder.

(5) The lateral flaps of the vaginal wall are now brought together over the sound; if the approximation involves too much tension they are dissected further back so they will come together without traction.

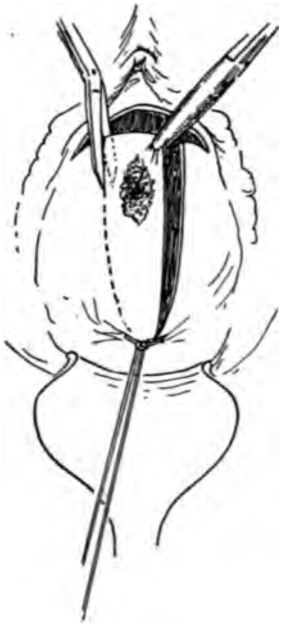


FIG. 328.—(149) PROCEDURE FOR EXTIRPATION OF URETHRA FOR CARCINOMA. (a) The urethra has been ligated at its base and is being dissected away from under the pubic arch.

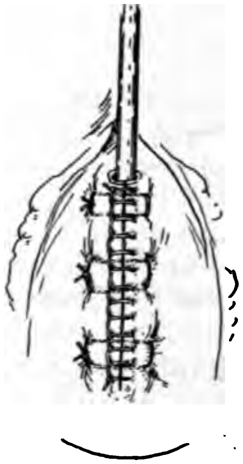


FIG. 329.—(149) PROCEDURE FOR EXTIRPATION OF URETHRA FOR CARCINOMA. (b) The urethra has been cut away; a self-retaining catheter inserted into the bladder; the vaginal membrane approximated, and sutured over the catheter by a continuous hemostatic suture fortified by three mattress sutures.

(6) The edges of the flaps are now stitched together (a) with a continuous hemostatic suture of fine chromic catgut, fortified by (b) through-and-through mattress sutures of heavier chromic catgut. The suture nearest the bladder is made to anchor the outer wall of the stump of the urethral canal (Figs. 329 and 330).

(7) The urethral sound is now inserted and a hard rubber sigmoid catheter introduced. This is worn for two or three weeks, being removed every second day to be cleansed.

(8) After the sigmoid catheter has been discontinued the newly

formed cicatricial urethra is kept dilated by the introduction of a large metallic catheter once or twice daily.

The preliminary ligature around the base of the urethra is made to embrace the lymphatics to prevent the migration of malignant elements that may be dislodged by the manipulations of the operation. The catgut sutures will generally take care of themselves.

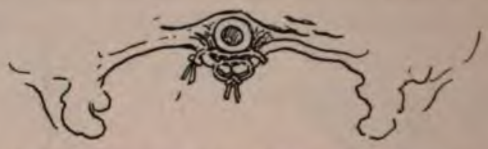


FIG. 330.—(149) PROCEDURE FOR EXTIRPATION OF URETHRA FOR CARCINOMA. (c) Cross section showing the two lines of suture.

TREATMENT OF CARCINOMA OF THE BLADDER

Carcinomata of the bladder should be treated only by extirpation, which should in all cases be undertaken at the earliest practicable moment. The treatment of papillomatous growths, probably malignant, by attempted removal with long forceps through a cystoscope is mere surgical or rather unsurgical tinkering.

Their removal may be accomplished (a) by curettage through the urethra, (b) by invasion (vaginal cystostomy), (c) by invasion of the bladder above the pubes ("suprapubic cystostomy" and "transperitoneal cystostomy"), and (d) by removal of the bladder.

150. PROCEDURE FOR CURETTAGE OF THE BLADDER THROUGH THE URETHRA

(1) With the patient in the knee-chest position the urethra is dilated, preferably with a Kelly dilator, until the largest size open cystic speculum can be introduced.

(2) (a) A small-sized Sims sharp curette is introduced with which the masses, or the softer portions of them, are scraped away, the larger fragments being removed by the alligator forceps; or (b) the growths are seized *in situ* by the alligator forceps and then pedicles cut by the alligator scissors; or (c) the pedicles are cut by a loop of cautery wire thrown around them.

(3) The débris is washed out by thorough irrigation.

(4) A large self-retaining catheter may be worn for several days through which the bladder should be irrigated with normal salt solution twice daily.

The objections to this procedure are several, viz.: (1) it is liable to provoke serious hemorrhage, which can not be easily controlled; (2) it leaves the pedicles as probable sources of further malignancy; (3) a cystitis, first traumatic, then infectious, is liable to ensue; (4) incontinence of urine from overdistention of the cystic orifice of the urethra is liable to ensue.

151. PROCEDURE FOR REMOVAL OF CARCINOMATA OF THE BLADDER THROUGH THE VAGINA (VAGINAL CYSTOSTOMY)

(1) The bladder is opened as in drainage for cystitis.

(2) The index finger is introduced and the cavity of the bladder carefully explored.

(3) The masses as found are either (a) cut away by being seized with forceps and their pedicles divided with scissors, (b) snared with a wire loop, or (c) scraped with a saw-edged scoop or curette.

(4) The débris is washed out and the artificial vesicovaginal fistula left open for drainage.

(5) After drainage from the bladder has ceased the fistula is closed.

This procedure has the following disadvantages, viz.: (1) but little if any of the field of operation can be brought under actual inspection; (2) growths on the posterior wall are reached with difficulty; (3) the hemorrhage induced may be great and difficult to control through the opening; (4) the probably malignant pedicles are left at their base; (5) the patient after a long and disagreeable convalescence must undergo a second operation to insure recovery.

152. HAGNER PROCEDURE FOR REMOVAL OF CARCINOMA AT THE FUNDUS OF THE BLADDER

(1) The bladder is irrigated and, if bleeding, adrenalin, 1-10,000, is instilled and allowed to remain five minutes.

(2) The bladder is then distended with salt solution, and a Nitze cystoscope is introduced.

(3) This is held in place by an assistant, while a suprapubic incision down to the bladder wall is made. The prevesical fat is well separated and the tissues well retracted by wide lateral retractors so as to give a good exposure of the bladder wall.

(4) The growth is then inspected through the cystoscope, the left hand holding the cystoscope; with the right a threaded needle is pressed on the fundus of the bladder, and the dimpling caused thereby is readily seen through the cystoscope.

(5) The needle is carried first to the left of the growth at a sufficient distance to give a margin of healthy bladder wall; it is then

plunged into the bladder and the suture then drawn through, being held in place by an assistant.

(6) The same procedure is employed at the right of the growth and at the lower border.

(7) An incision is made through the bladder wall around the outer side of the three traction sutures, the portion of the bladder wall to be removed being clamped as the incision is advanced.

(8) The bladder wall containing the growth is lifted up by the clamp and held by an assistant.

(9) The fluid left in the bladder is removed by a large syringe through the suprapubic wound to prevent its entrance into the peritoneal cavity, and the cavity of the bladder is packed with gauze.

(10) The incision in the bladder wall is then carried upward into the peritoneal cavity and a portion of the parietal peritoneum covering the growth is removed.

(11) The bladder and peritoneal wounds are then closed by two rows of chromic gut sutures, a suprapubic drain being left in the bladder.

It would seem that a free opening through the exposed wall of the bladder and direct inspection of the interior would be safer and easier, rendering the use of the cystoscope unnecessary, as in the following:

153. PROCEDURE FOR EXTIRPATION OF CARCINOMATA OF THE BLADDER BY THE SUPRAPUBIC ROUTE (SUPRAPUBIC CYSTOSTOMY)

(1) After the pubes have been shaved and the bladder distended with sterilized salt solution, an incision is made in the median line beginning at the symphysis and extending upward from 7 to 10 cm., according to the fleshiness of the patient.

(2) The incision is carried down to the pubic bone, the fatty layer is dissected back on either side above the fascia, which, with the underlying structures, is divided transversely 1 cm. above the bone.

(3) The peritoneal fold, if encountered, is dissected up out of the way and the wall of the bladder is exposed and seized with volsella at either angle of the wound.

(4) A catheter is introduced, the salt solution drained off through the urethra, and the catheter left in.

(5) The bladder is now laid open from one volsellum to the other.

(6) The tumor masses are now dealt with according to their various characteristics either by (a) scissors, (b) the snare, or (c) the actual cautery.

(7) The cavity is now thoroughly inspected, all bleeding points are controlled, and the question of subsequent drainage is determined.

(8) If drainage is resolved upon it may be done either (a) through the urethra, by means of a self-retaining mushroom-tipped catheter, or (b) through the incision, which may be left open in whole or in part for the purpose, or (c) through-and-through drainage may be practiced.

(9) The abdominal incision is now treated in accordance with the preceding indications.

The advantages of this procedure are that (a) it gives an opportunity for actual inspection of the interior bladder; (b) it gives actual control over the field of operation; (c) it enables the operator to determine the actual condition on the inside of the bladder; (d) it facilitates complete drainage, and (e) under urethral drainage the external incision closes spontaneously. Its disadvantages are: (a) it does not enable the operator to determine the question of metastases, nor (b) control complicating conditions within the pelvis; (c) nor does it afford the fullest possible direct inspection of the interior of the bladder.

154. C. H. MAYO PROCEDURE OF TRANSPERITONEAL CYSTOSTOMY

(1) The patient is placed in the high Trendelenburg position and a median incision made from the pubes upward for 15 cm. or more, and the pelvis is well packed with gauze pads, which hold the intestines in the upper abdomen; the abdominal incision is also protected with gauze pads.

(2) The bladder is caught by two tenaculum forceps, lifted into the wound, and opened by a 5-cm. median incision. The small amount of fluid in the bladder is absorbed with gauze, and the incision is enlarged upward and downward until it is ample for the purpose.

(3) (a) The tumors are cut from the bladder and the denuded area burned with a cautery, or, preferably, they are raised with tenacular forceps and resected with a Paquelin cautery (Fig. 331). No sutures are required for these areas, which are permitted to close by cicatrization.

(b) (1) If the malignant growth necessitates the removal of a great part of the bladder, (2) it is divided and removed freely, whether covered by peritoneum or not. In making this incision 1 to 1.5 cm. of tissue about the urethral orifice should be saved, if possible. (3) If the bladder be involved at the ureteral opening, after the diseased portion of the viscus is removed, (4) the ureter is divided near the bladder and drawn into the abdomen through a perforation in the peritoneum, close to the remaining half of the bladder, (5) into which it is passed and where it is attached with catgut sutures. (6) The peri-

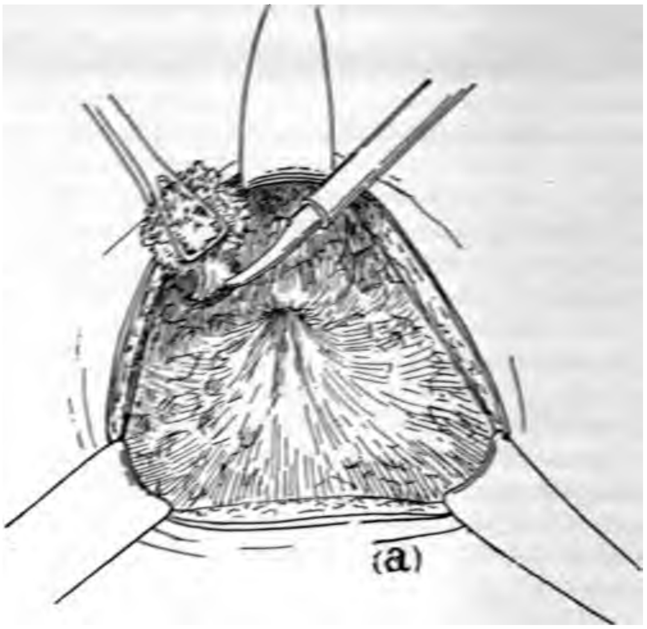


Fig. 331.—(154) Mayo (C. H.) Procedure for Transperitoneal Removal of Carcinoma of the Bladder. (a) The bladder is opened at the fundus and the tumor is being removed by the cautery.

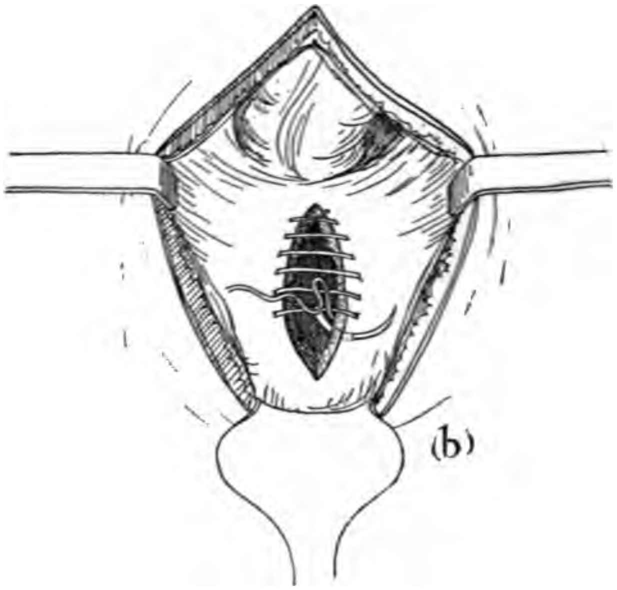


Fig. 332.—(154) Mayo (C. H.) Procedure for Transperitoneal Removal of Carcinoma of the Bladder. (b) Method of applying the deep line of suture.

toneum is closed over the exposed ureter in a fold by a few sutures, which insures rapid healing.

(4) The bladder wound, regardless of its size, is closed by a through-and-through continuous suture of catgut. This stitch is a running mattress suture passed through the entire thickness of the bladder wall, all loops pulling from the mucous side, and, when drawn close, making a complete airtight and watertight continuous mattress stitch (Fig. 332).

(5) The line of suture is now protected by a suture of silk or preferably linen applied as a parallel peritoneal suture, taking a square bite of peritoneum, first on one side, then on the other, of the line of closure, the needle being inserted parallel with the incision (Fig. 333).

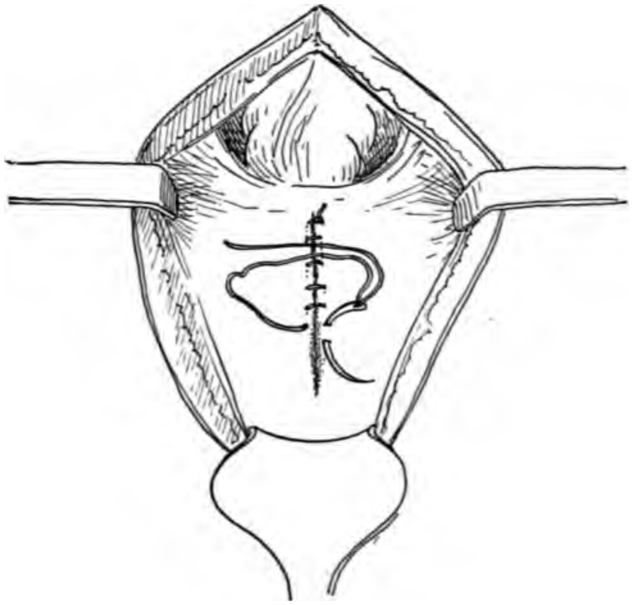


FIG. 333.—(154) MAYO (C. H.) PROCEDURE FOR TRANSPERITONEAL REMOVAL OF CARCINOMA OF THE BLADDER. (c) Infolding of the peritoneum by the Connell suture.

Should the bladder incision pass forward of the peritoneal fold the closure will be the same, and is accomplished by drawing the bladder toward the abdomen and carrying the peritoneal fold toward a lower level, the advantage of securing early peritoneal adhesions being thus secured to the fullest extent.

As a rule, the abdominal wound is closed without drainage, but, should the general cavity of the peritoneum become soiled, a temporary drain could be made with a stab-wound.

The bladder is catheterized, if necessary, at regular intervals the first few days following the operation, but as a rule the pa void their urine at frequent intervals with little distress.

May reports five cases, 2 benign, 3 malignant, successfully opera upon by this method. In one case four inches of the bladder was sected by the cautery.

155. PROCEDURE FOR EXTIRPATION OF THE BLADDER F CARCINOMATA

(1) The bladder is explored by the transperitoneal route (see C. Mayo Procedure—154—just described).

(2) If the mucous membrane is found to be too completely volved to be saved, and if the iliac or other glands are not beyond the practicability of enucleation, the peritoneum is seized either side of the vesicouterine fold and drawn up.

(3) The anterior leaflet of the broad ligament is seized with f ceps about 1 cm. from the tubal margin of the ligament and 3 c medianwise from the ovarian artery.

(4) The forceps thus placed are successively drawn up and slight apart, thus defining a taut fold along which the peritoneum is open from one outer forceps to the other, care being taken to avoid t uterine and ovarian arteries and veins. The round ligament may divided if more convenient.

(5) The vesicoparietal fold of the peritoneum is now similarly d vided, beginning at the peritoneal incision on one side and extendin around the bladder anteriorly to the same incision on the other sid thus defining an ellipse.

(6) The bladder is now enucleated by dissection with gauze down the urethra, which is excised, and the bladder drawn up with the urete still attached. All bleeding points are controlled as encountered.

(7) The cystic end of each ureter is now seized with forceps ar cut off at the bladder, thus freeing the latter, which is removed.

(8) The ureters are enucleated until they can be brought up ar delivered from under the uterine arteries.

(9) The ureters are now anastomosed into the colon or sigmoi or one into the cecum and the other into the sigmoid, as may be mo convenient (see Procedure for Ureterointestinal Anastomosis).

(10) If the lymphatics are involved the connective tissue in whi they are imbedded is removed.

(11) A self-retaining mushroom-tipped catheter is passed o through the urethra for drainage.

(12) The peritoneum first and the abdominal wall next are close

TREATMENT OF CARCINOMA OF THE KIDNEY

Treatment of carcinomata of the kidney is exclusively surgical and embraces: (a) extirpation of the kidney (see Procedure for Nephrectomy under Injuries of the Kidney); (b) extirpation of the kidney and ureter by the following:

156. KELLY PROCEDURE FOR EXTIRPATION OF THE KIDNEY AND URETER (NEPHROURETERECTOMY) FOR CARCINOMA

(1) A transverse incision is made in front of the quadratus lumborum muscle and extending 16 cm. across the abdomen in the umbilical line, reaching nearly to the right linea semilunaris.

(2) Numerous bleeding vessels are clamped and tied with catgut.

(3) The renal vessels are isolated and clamped and the kidney cut away above the clamp, but dividing the ureter.

(4) The kidney with ureter attached is now delivered through the incision.

(5) By traction in the kidney the ureter is made tense and dissected with finger and gauze from its connective tissue down to the brim of the pelvis, the peritoneum, ascending colon, and cecum being pushed away by the finger. The iliac artery is now easily felt and avoided.

(6) With the hand introduced into the cellular tissue, at first between the peritoneum and the abdominal wall, then under the peritoneum of the false pelvis, and finally between the peritoneum and the walls of the true pelvis, the ureter is freed down to the vaginal portion.

(7) An incision is made in the semilunar line over the brim of the pelvis, laying the ureter bare at the brim of the pelvis.

(8) The kidney previously liberated is now buttoned under the bridge of abdominal wall left intact.

(9) The pelvic portion of the ureter is now delivered, tied at its cystic end, and cut away.

In certain cases Kelly reaches the anterior portion of the ureter by digital dilatation of the little orifice through which it passes under the broad ligament. In some instances the bladder wall surrounding the ureteral orifice is cut away and carefully closed.

TREATMENT OF CARCINOMA OF THE RECTUM

The treatment of carcinoma of the rectum is divisible into two classes, viz.: (a) radical treatment, involving the complete removal of all infected areas and of all areas probably infected, applicable only in the early stages, when there is reasonable prospect of cure; (b) palliative treatment, involving measures for the mitigation of suffering in cases in which there is no prospect of cure.

(a) **Radical Treatment.**—Radical treatment consists in the complete removal of the rectum and of the perirectal lymphatics. For this purpose several useful procedures have been evolved out of the general experience. They are severe operations, involving a strain on the patient's vitality and a test of her powers of resistance to sepsis. It is important, therefore, that the patient be placed in the best possible condition for the operation. Without sacrificing too much time to the purpose, thereby permitting the disease to develop, the patient's strength should be built up by approximate diet. The bowels should be carefully unloaded just preceding operation, and, in ulcerative cases, the rectum should be antisepticized.

157. KRASKE PROCEDURE FOR EXTIRPATION OF THE RECTUM

(1) With the patient on her right side, her thighs flexed, an incision is made in the middle line from the anal margin through the anal sphincter to the middle of the sacrum.

(2) The gluteus maximus is cut away from the sacrum and the coccyx.

(3) The coccyx is excised.

(4) The sacroiliac ligament is divided close up to the rectum.

(5) The sacrum is excised just below the third posterior sacral foramen.

(6) Expose the rectum by cutting away the structures lying between it and the sacrum.

(7) Separate the gut from its other surroundings with finger and gauze. After the rectal mesentery has been thus bluntly loosened the rectum is pulled down to locate some point above the disease, at which, after excision of the gut, the stump can be anchored without too much traction, care being taken not to open the gut during this or preceding steps of the operation.

(8) The gut is excised transversely with the cautery from 2 to 3 centimeters above the disease, and at the same distance below the disease.

(9) The upper segment and the lower segment of the rectum are now stitched to each other by interrupted suture.

(10) The whole wound is carefully cleansed and partially closed from above downward, the remainder being packed by iodoform gauze. The wound closes by granulation.

The posterior sutures often give way and a fecal fistula generally results.

158. W. J. MAYO PROCEDURE FOR EXTIRPATION OF THE RECTUM FOR CARCINOMA

(1) With the patient face down in the Trendelenburg position a median incision is made from near the anus up to a point between the middle and base of the sacrum.

(2) The sacrum, divided transversely with a chisel at the second foramen, or at the level of the sacrosciatic notch, is excised with the coccyx, care being taken to ligate the midsacral artery.

(3) The levator ani muscle is divided in the median line, and the sphincter ani muscles, external and internal, are wiped away from the mucosa by means of gauze.

(4) The rectum is freed above the disease, the peritoneum is opened and packed with gauze, the sigmoid is drawn down, the inferior mesenteric artery ligated, the mesorectal folds are opened, and the fat and glandular tissue are wiped away with gauze.

(5) Pull the rectum upward (inward); clamp and divide it at the mucocutaneous juncture.

(6) Clamp and divide the gut well above the disease and remove the diseased segment.

(7) Bring the sigmoidal stump downward, pull it 1.5 cm. through the anus, and fix it with safety pins. If the tension is too great liberate the bowel above.

(8) Suture the levatores ani together and to the posterior wall of the gut for a distance of 7.5 cm. upward from the anus.

(9) Remove the peritoneal packs, attach the peritoneum to the gut, drain with split rubber tubes containing strips of gauze, and partly close the external wound.

After 48 hours remove part or all of the drains, according to the condition of the wound, and fill the wound with 5 per cent. balsam of Peru in castor oil. Subsequent packing is to be confined to the cutaneous layer.

159. J. B. MURPHY PROCEDURE FOR RESECTION OF THE RECTUM BY THE VAGINAL ROUTE

(1) The patient is placed in the lithotomy position, the vagina is dilated with broad specula, and the cervix is drawn down with traction forceps and the cul-de-sac freely opened.

(2) A large gauze pack is inserted through the opening in the cul-de-sac to retain the intestines.

(3) The posterior vaginal wall is divided down to, but not through, the rectal wall by an incision extending in the median line from the

incision in the cul-de-sac to, but not through, the sphincter ani muscle.

(4) The lateral halves of the vaginal wall are now dissected back, thus exposing the rectum, lateral traction being used to afford a wide field.

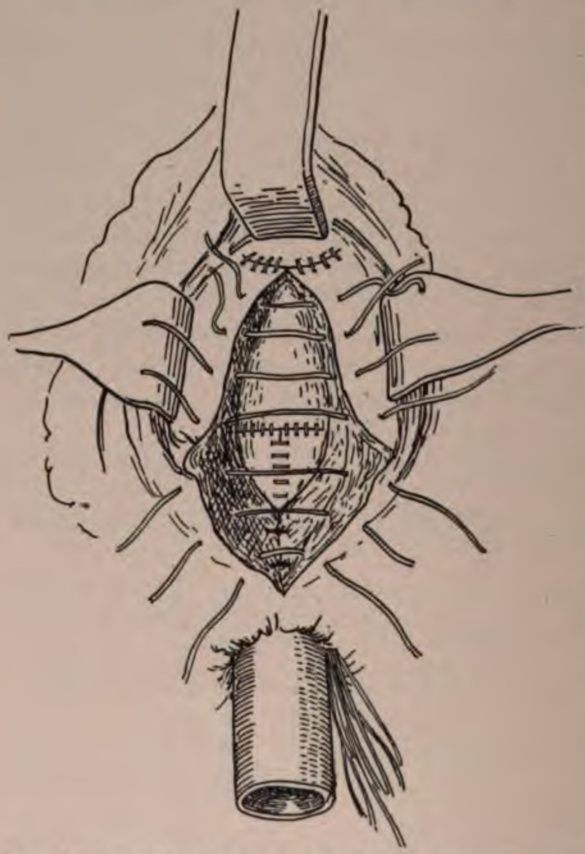


FIG. 334.—(159) MURPHY (J. B.) PROCEDURE FOR VAGINAL PROCTECTOMY. The diseased zone has been removed; the sigmoid and rectum have been united end to end; the longitudinal rectal incision closed; all rectal sutures left long and brought out through the anus; the deep fascia has been approximated by two buried sutures, and interrupted silkworm gut sutures have been inserted in the vaginal wall and perineum preparatory to closure, and rectal tube has been sewed in.

(5) The sigmoid is now drawn down, explored by the fingers, and replaced.

(6) The anterior wall of the rectum is divided vertically in the median line from just above the sphincter ani muscle to just below the diseased zone.

(7) The anal segment is separated from the diseased segment of the rectum by transverse incision about 2.5 to 4 cm. below the growth. This incision extends into the retrorectal connective tissue.

(8) The lower end of the upper segment is temporarily closed by being seized with clamps to prevent escape of contents.

(9) The upper segment thus clamped is liberated with scissors dissection from the coccygeal and postrectal attachments upward to the promontory of the sacrum, and even over the iliac vessels. The profuse hemorrhage incident to this stage of the operation can be easily controlled by forceps and sponge pressure.

(10) The sigmoid is loosened sufficiently to allow its healthy portion to come down to the upper end of the anal segment of the rectum.

(11) The rectum is double clamped and amputated about 2 cm. above the diseased zone.

(12) The sigmoid and anal segments are united end to end and the longitudinal incision in the rectum is closed by silk suture, passed from within outward, so that when tied the knots and ends, left long, will be on the inside of the bowel, the long ends being brought out through the anus (Fig. 334).

(13) The sphincter, if divided, is then united with buried suture of catgut.

(14) The gauze pack having been removed, the peritoneal opening is closed by transverse suture.

(15) The transverse incision, now closed, is stitched to the cervix.

(16) The edges of the vertical incision, including the underlying fascia and perineal muscles, are sutured in the middle raphe by interrupted silkworm gut sutures.

(17) A large rubber drainage tube, 2.5 cm. in diameter, is introduced into the rectum and sewed in place.

Murphy claims for this procedure, as compared with other operations, that (1) it leaves the sacrum and posterior wall of the pelvis undisturbed; (2) it affords an extensive approach with equal accessibility to the anatomic parts; (3) it offers no greater danger from peritoneal contamination; (4) it affords greater facility for inspection and for further extension of the operation; (5) it lends itself to convenient drainage of the peritoneum, if demanded, through the vagina; (6) a perfect end-to-end approximation may be secured; (7) the sphincter is retained and the perineal body is restored, with, however, diminished power of the levator ani muscle; (8) when the operation is complete the parts are practically in their normal relations.

160. C. H. MAYO PROCEDURE FOR EXTIRPATION OF THE RECTUM BY ABDOMINOPERINEAL METHOD

(1) With patient in high Trendelenburg position, abdomen freely opened in median line, the upper limits of the growth and its relations are carefully determined.

(2) The intestines, with the exception of the sigmoid, are carefully packed away with gauze pads.

(3) Two clamps are caught across the lower sigmoid on a level with the promontory of the sacrum, and the bowel divided by transverse incision between the clamps.

(4) The mesosigmoid is liberated by lateral incisions and the proximal end of the bowel brought up outside of the abdominal wall.

(5) The end of the sigmoid is closed by a comprehensive ligature and the forceps removed as the ligature is drawn tight. A purse-string suture is then placed around the sigmoid 1.5 cm. above this ligature, the end of the sigmoid invaginated, and its lumen closed by tying the purse-string suture, the ends of which are left long.

(6) The distal stump is treated by inversion in the same way.

(7) The rectum is now liberated from the uterus by lateral and peritoneal adhesions.

(8) The inferior mesenteric artery, which is the upper continuation of the superior rectal, is caught and tied above and to the left of the promontory of the sacrum, at as high a level as can be done safely without interfering with the nutrition of the upper segment of the bowel.

(9) The fat is carefully separated, the entire mass of gland-bearing tissue with the fat is wiped away perfectly clean to the periosteum.

(10) A sponge dissection is made down to the common iliac, exposing the uterus, the middle sacral and the middle hemorrhoidal vessels being seized and ligated as encountered.

(11) The entire area is now packed with gauze and the patient placed in the perineal position.

(12) "In some cases, if the bowel is healthy for a space of four inches above the anus, it is clamped and ligated at this point, and cut above the ligatures, the diseased area being removed."

(13) A pair of forceps are passed into the blind pocket of the rectum from below, the tied end of the bowel pushed into the open forceps, which are withdrawn through the anus, thus inverting the bowel.

(14) After cleansing, the thread of closure is cut, the upper gauze pack removed, and the forceps passed through the invaginated bowel and anus into the pelvis to grasp the lower end of the proximal segment, which is withdrawn, and the two ends united by a circular end-to-end closure and allowed to retract (Fig. 335).

(15) Drainage is secured by a middle incision in front of the coccyx, through which tube drainage is made into the pelvis.

The superiority of this procedure is the fact that it brings all conditions within the pelvis under control, and that the intrapelvic glands are thoroughly removed.

(b) **Palliative Treatment.**—Palliative measures are restricted to inoperable and consequently hopeless cases. It is culpable under any circumstances to advise them or any of them as substitutes for operation in cases that are yet within the possibilities of cure by operation.

These measures resolve themselves into (a) medicinal and (b) surgical.

(a) *Medicinal measures* are required to control pain and, in ulcerative cases, to mitigate the offensiveness of the discharge.

Opium or its derivatives should be given as freely as may be required to control pain. There ought to be no hesitancy in mercifully obtunding the sensibilities of the patient to the most wretched suffering, physical and mental, that can be inflicted by one of the most painful and loathsome of diseases.

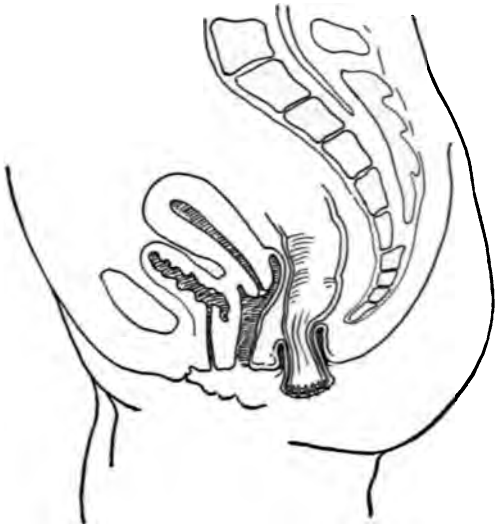


Fig. 335.—(160) Mayo (C. H.) Procedure for Abdominorectal Proctectomy. The carcinomatous zone has been removed from above, the anal segment of the rectum everted, the sigmoidal segment has been brought down through the anus, and the two ends stitched together, preparatory to being pushed back.

Topical medication can sometimes mitigate the offensiveness of the condition. Antiseptics and deodorants of various kinds may be applied with advantage. The milder permanganates or chlorids and carbolic solutions are sometimes effective as mitigants. Irrigations with tepid dilute acetic acid (vinegar) occasionally act very well.

Binnie states with great conservativeness that "various antiseptics have been administered by the mouth in the hope of lessening the filthiness of the rectum (resorcin, salol, etc.), but, in the opinion of the writer (Binnie), such endeavors must be as futile as an attempt to antisepticize the Mississippi river at New Orleans by pouring a barrel of corrosive sublimate into its stream at St. Paul."

(b) *Surgical treatment* of rectal carcinoma for palliative purposes is addressed to (1) the relief of ulcerated or excavated growths and (2) to the relief of obstruction, sometimes induced by stenosis of the bowel.

(1) The surgical relief of ulcerated surfaces is sometimes accomplished by curettage, which may be employed in that form of malignant growth in which numerous cauliflower-like masses project into the rec-

[illegible] and [illegible] the profuse discharge of pus and blood. These [illegible] them down to a level [illegible] the raw surface thoroughly with [illegible] The treatment should be repeated as soon as the growth returns.

2. The surgical relief of obstruction may be accomplished by [illegible] internal proctotomy, [illegible] posterior proctotomy, and [illegible] colostomy or sigmoidostomy.

[illegible]—Sometimes there are patients suffering from new growths of the anus and [illegible] rectum who are threatened [illegible] straining in their efforts to move the bowels, who yet refuse to let the knife be used. In [illegible] stretching the rectum, either with the fingers [illegible] best, and temporary relief [illegible] because [illegible] the rectum can be unloaded.

Internal proctotomy consists in passing a probe-pointed bistoury [illegible] the structure or growth [illegible] necessary to relieve the obstruction. [illegible] contraction follows, and the operation requires to be repeated.

Posterior proctotomy is, next to colostomy, the best of all the [illegible] operative procedures. It is performed as follows: Protect [illegible] with the finger and [illegible] above the obstruction, then [illegible] backward to the [illegible] structures, and thence downward, carrying [illegible] through the rectum and [illegible] until the cut is on a level with the tip of the coccyx, thus making a long, deep, triangular wound that [illegible] for the [illegible] of accumulated feces, and at the same time permits free drainage, a great advantage over the internal method. Post-operative treatment consists in topical applications to the ulceration, and the occasional passage of a bougie to prevent [illegible] contraction.

Colostomy, or, more properly, sigmoidostomy, is the most practicable means of [illegible] cases. I began this measure under the teachings of Thomas Bryant with left lumbar colostomy. It was an operation [illegible] and brought great relief. The [illegible] below the opening would, however, frequently [illegible] a source of trouble, while the [illegible] the back, when it could not [illegible] at times intolerable. I [illegible] sigmoidostomy, either [illegible] through the vagina or [illegible] left inguinal region, preferably the former.

161. PROCEDURE FOR (A) VAGINAL, (B) INGUINAL SIGMOIDOSTOMY IN CASES OF INOPERABLE CANCER OF THE RECTUM

(1) With the patient in the dorsal position, the cul-de-sac is freely opened through the vagina.

(2) (a) Two fingers are introduced up to the left brim of the true pelvis and the sigmoid felt for. It can ordinarily be reached without difficulty. (b) If it is not readily felt pressure by the other hand over the left iliac region will bring it down. (c) If this does not answer an incision is made just above Poupart's ligament.

(3) The sigmoid, when found, (a) if long enough, is brought down and the loop fixed by sutures in the vaginal opening; (b) if not long enough to be brought down as a loop it is divided and the distal end fixed in the abdominal wound, and the proximal end, after the sigmoid has been sufficiently loosened, is brought down and fixed in the vaginal opening.

(4) If, in consequence of conditions within the pelvis, such as serious adhesions, the vaginal anastomosis is impracticable, then (a) the sigmoidal loop is brought well out of the abdominal wound; (b) the parietal peritoneum is stitched with continuous suture to the intestinal peritoneum, and, (c) by a fixation suture of silkworm gut passed through each angle of the wound, is made to transfix the wall without entering the lumen of the sigmoid.

(5) If the intestinal distention is very great the sigmoid may be opened at once, although it is better, if practicable, to let 24 hours elapse before the gut is opened. This is better done by a transverse incision transversely dividing about two-thirds of the intestine.

After a few days the rectal segment ought to be invaded by careful irrigation, and this ought thereafter to be repeated at intervals of a few days.

TREATMENT OF CARCINOMA OF THE BREAST

The treatment of carcinoma of the breast is to be classified as (a) curative and (b) palliative.

Curative treatment is exclusively surgical and is restricted to cases recognized as operable.

Palliative treatment may be either medical or surgical, and is applicable only to cases in which the disease has become so far advanced as to be inoperable.

All cases are to be recognized as operable in which the breast is yet movable, and in which any determinable metastasis is restricted to lymphatic glands that are within the range of operation.

[illegible]

[illegible]

[illegible] the pectoralis major [illegible] to the clavicle. This [illegible]

[illegible] portion of the pectoralis [illegible] as the latter is drawn upward by a broad sharp retractor. This tissue is rich in lymphatics *and is sometimes infected with cancer.*

(6) The splitting of the muscle is continued out to the humerus, and the part of the muscle to be removed is now cut through close to its humeral attachment.

(7) The whole mass, skin, breast, areolar tissue, and fat, circumscribed by the original skin incision, is raised up with some force, to put the submuscular fascia on the stretch as it is stripped from the thorax close to the ribs and pectoralis minor muscle. It is well to include the delicate sheath of the minor muscle when this is practicable. This step has been modified by Halstead, in that he removes the pectoralis minor and exposes the subclavian vein at its inner part.

(8) The axilla is now stripped of its contents and its anterior wall at one time, from within outward and from above downward. The axillary contents are dissected away with scrupulous care and with the sharpest possible knife. The axillary vein should be stripped absolutely clean. Not a particle of extraneous tissue should be included in the ligatures which are applied to the branches, sometimes very minute, of the axillary vessels. In liberating the vein from the tissues to be removed it is better to push the vein away from the tissues rather than, holding the vein, to push the tissues away from it. It may not be necessary, but it is well to expose the artery and remove the possibly infected tissue above it. It is best to err on the safe side and remove in all cases the loose tissue above the vessels and about the axillary plexus of nerves.

(9) Having cleaned the vessels, we may proceed more rapidly to strip the axillary contents from the inner wall of the axilla—the lateral wall of the thorax.

(10) When we have reached the junction of the posterior and lateral walls of the axilla, or a little sooner, an assistant takes hold of the triangular flap of skin and draws it outward, to assist in spreading out the tissues which lie on the subscapularis, teres major, and latissimus dorsi muscles. The operator cleans the posterior wall of the axilla from within outward. The subscapular vessels are exposed and caught before being divided. The subscapular nerves may or may not be removed.

(11) Having passed these nerves the operator has only to turn the mass back into its normal position and to sever its connection with the body of the patient by a stroke of the knife from B to C, repeating the first cut through the skin.

(12) This step did not belong to Halstead's original operation, but has been added by him subsequently: Make a vertical incision parallel to and near the posterior margin of the sternomastoid muscle, dividing

a few of the posterior fibers of the muscle. Expose the junction of the internal jugular and subclavian veins. Divide the omohyoid muscle at its tendinous part, and draw its two bellies out of the way. Remove the supraclavicular fat by dissecting downward and outward from the venous junction, and the infraclavicular fat by dissecting from below. By elevating the shoulder the clavicle can be raised an inch or more away from the first rib, when the operation is so far completed as to make this desirable. The web of fibrous tissue which binds the subclavian vein loosely to the clavicle is thus spread out and can be easily removed. The fingers can be passed from the supraclavicular to the infraclavicular and to the subscapular regions under the clavicle, and any fat in the latter region, near the internal or the posterior border of the scapula, between the serratus magnus and the subscapular muscles, which could not be well reached from the axilla, can be drawn out through the neck.

(13) Review the whole wound. Unite the divided omohyoid by a catgut suture. Close the wound in the neck. The edges of the chest wound are approximated by a buried purse-string suture of strong silk. Of the triangular flap of skin only the base is included in this suture. The rest of the flap is used as a lining for the fornix of the axilla. The axilla is never drained. The open wound remaining on the chest is immediately covered with Thiersch's skin grafts.

163. RODMAN PROCEDURE FOR COMPLETE EXTIRPATION OF THE BREAST AND LYMPHATICS FOR CARCINOMA

This procedure, as described by Rodman himself in his "Diseases of the Breast," is as follows:

(1) A straight incision is made beginning one inch below the clavicle, two finger-breadths from and parallel with the sulcus between the deltoid and the clavicular portion of the pectoralis major muscle, according to the stature of the subject and the size of the breast. It is rapidly carried down through the skin and superficial fascia to the fascia covering the great pectoral muscle. No hemorrhage of consequence is encountered thus far. I prefer to place this incision not too close to the arm, for, in my judgment, incisions extending on to the arm result in cicatrices, which often seriously interfere with the future usefulness and less frequently cause edema of the limb (Fig. 337).

(2) (a) The index finger of the left hand is now introduced beneath the lower border and made to emerge above the upper border (Fig. 338) of the tendon of the great pectoral muscle or (b) is inserted in the interval between the costal and clavicular portions, if one wishes to remove only the costal origin of the muscle, and (c) division of the tendon is effected at or near its insertion into the humerus. This may

be facilitated by (d) dissecting up the external flap slightly and using retractors. I myself see no reason for removing the clavicular portion in the average case, and, therefore, leave it unless the growth is peripheral and in the upper hemisphere. Then, unquestionably, the entire muscle should be sacrificed (Fig. 339). (d) Only a slight dissection will be necessary to discover the lower edge of the tendon of the pectoralis

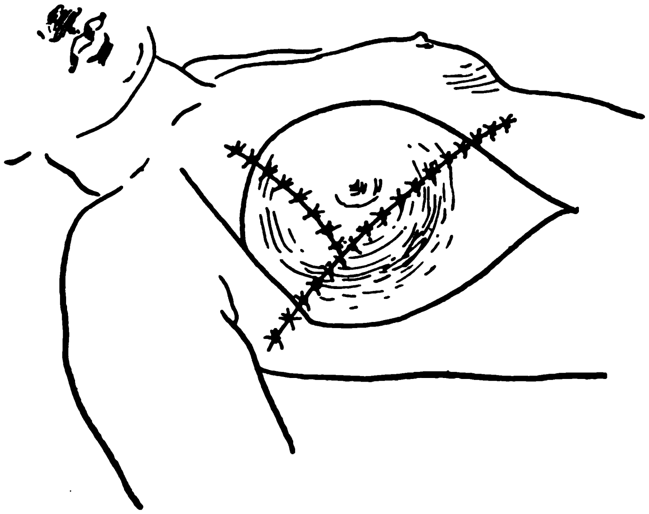


Fig. 337.—(163) Rodman Procedure for Extirpation of the Breast for Carcinoma. (a) The completed Rodman incision is shown by the heavy dark line; the closure, by the sutured line.

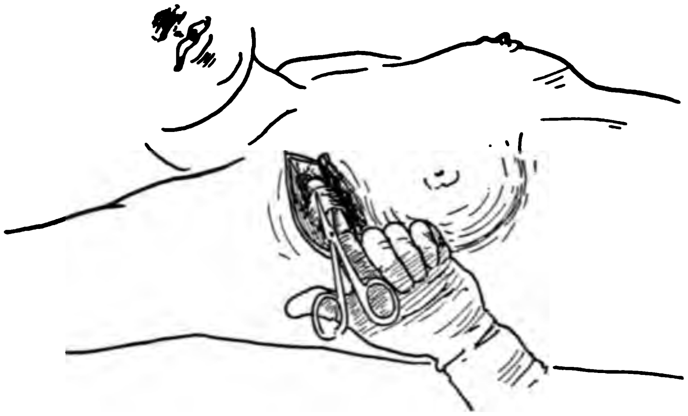


Fig. 338.—(163) Rodman Procedure for Extirpation of the Breast for Carcinoma. (b) The beginning incision with the isolation and division of the head of the pectoralis major muscle.

minor. This should be clearly identified and separated from the fasci covering the tendon and below it. Otherwise the long thoracic arter which runs in the fascia parallel with and just below the tendon ma easily be wounded.

(3) The index finger is now introduced underneath the muscle an made to emerge at its upper border. Lifting up the muscle, the tendo

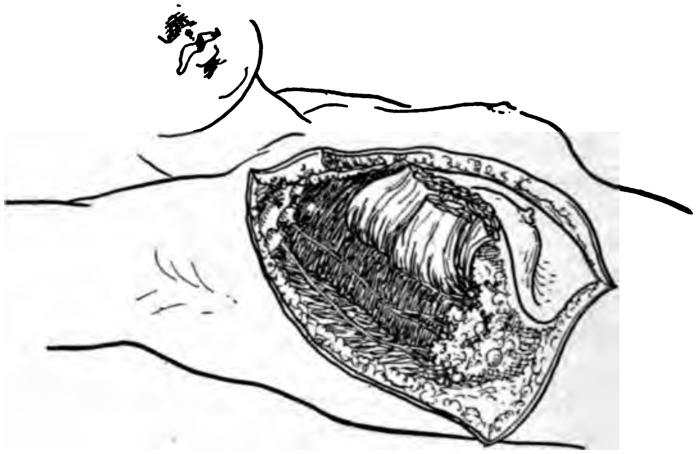


Fig. 339.—(163) Rodman Procedure for Extirpation of the Breast fo Carcinoma. (c) The completed incision with the pectoralis muscles an the breast turned back, exposing the deep nerves and lymphatics.

is made tense and prominent, so that it can readily be seen that nc other tissues are included with the tendon. The acromiothoracic artery runs just above and parallel with this tendon, and, being a branch of considerable size, might cause some little embarrassment if it were cut at this stage of the operation.

(4) It is divided at its insertion into the coracoid process. Therefore, we have the acromiothoracic artery parallel with and just above the upper border of the minor pectoral tendon; the long thoracic parallel with and just below its lower border. Both can easily be avoided if care is taken. I have never as yet wounded either vessel, nor is there excuse for doing so. Both muscles retract inward as soon as their respective tendons are severed. This at once uncovers the axilla and makes its subsequent thorough dissection easy.

(5) The costocoracoid membrane is now opened and largely sacrificed, which gives ready access to the subclavicular fat at the apex of the axilla—in the space of Mohrenheim. In removing a part of the costocoracoid membrane the cephalic vein at the upper and outer aspect of the wound must not be wounded. There is also in the fascia

a branch of the acromiothoracic which, with its accompanying vein, should be clamped and tied. A nerve supplying the pectoral muscle may as well be sacrificed now, as it necessarily must be later on when the muscles are removed.

(6) The dissection is begun at the apex of the axilla, and must be most carefully conducted lest injury be done to either the axillary vein or the acromiothoracic artery. It should be from above downward, though this is perhaps somewhat more difficult than making the dissection from below upward.

(7) In the removal of the fat and fascia in the upper third of the axilla the finger covered by several thicknesses of gauze will be all that is necessary. Instruments are rather dangerous, unless used most cautiously. Moreover, they are unnecessary.

(8) I now carefully make an incision through the fascia to the outer side of the axillary vessels, simply to start the dissection from without inward. This is made to the extent of the lower two-thirds of the axilla, and not in the upper third, where it is dangerous to cut.

(9) I continue the dissection largely with gauze, but Allis's or Mayo's blunt dissectors may be used freely and are most helpful. Occasionally a cut with scissors or a sharp knife facilitates the dissection. The instrument of Charles H. Mayo is more than a blunt dissector, for it can also be used as a scissors, and is most valuable in economizing time, making a change of instruments unnecessary.

(10) As the sheath and fat are removed from the vessels we come down upon the acromial, long, and alar thoracic branches and the subscapular branch of the axillary artery in the order named, from above downward, which, with their accompanying veins, are to be carefully clamped in two places and divided between. The proximal ends are ligated. In this way the subsequent hemorrhage is materially lessened; in fact, it is surprising how little blood will be lost during so prolonged and extensive a surgical procedure.

(11) The enlarged lymphatic glands will usually be found at the base of the axilla between the latissimus dorsi, teres major, and subscapularis muscles posteriorly; the serratus magnus internally; and inferior to a line formerly indicated by the situation of the lower border of the pectoralis minor. The midaxillary and subclavian glands may, however, be infected. All such enlarged glands and surrounding fat should be carefully dissected from the several muscles, and to do this best the fascia covering the muscles should be sacrificed. In fact, so thorough should be the axillary dissection that nothing is left on its inner aspect save the posterior thoracic or nerve of Bell; on the posterior aspect only the long subscapular nerve, and superiorly possibly

the superior thoracic artery, if it arises as an independent branch high up on the first portion of the axillary.

(12) The wound is closed by interrupted suture (Fig. 340).

The superiority of the Rodman technique is that it embraces the advantages of the Halstead procedure without incurring its dangers. It also embraces the principle first enunciated by Myer, that the extirpation should begin from the axilla and extend downward rather than the reverse. The probable danger of expressing the cancer elements from the original growth into the axilla is thereby avoided. The old method of opening the axilla in the median line resulted in the development of firm adhesions and the formation of a cicatricial raphe, both of which interfered with the subsequent mobility of the arm. The cicatricial binding of the axillary vessels often resulted in edema of the arm. All these difficulties are obviated by both the Halstead and Rodman procedures. Rodman has not found it necessary thoroughly to denude the ribs of their muscular covering, and leaves a portion of the serrated termini of each pectoralis muscle. He also leaves some of the head of each muscle, the complete oblation of which he finds unnecessary for the removal of the glands. These remnants of the muscle are important in supporting skin grafts, sometimes made necessary by the removal of large areas of integument at the time of operation.

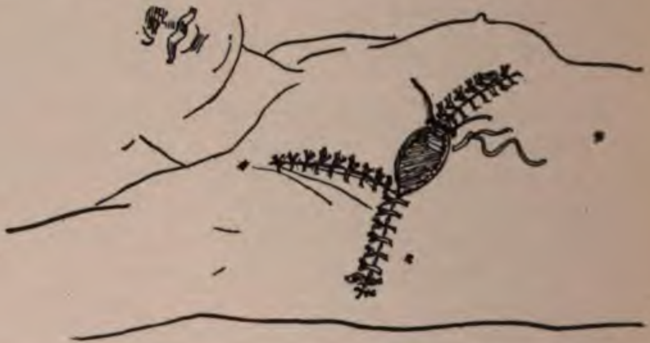


FIG. 340.—(163) RODMAN PROCEDURE FOR EXTIRPATION OF THE BREAST FOR CARCINOMA. (d) Method of closure.

164. JACKSON (JABEZ N.) PROCEDURE FOR EXTIRPATION OF THE BREAST FOR CARCINOMA

(1) Begin the incision at a point about one and a half inches below the clavicle in the sulcus, between the deltoid and pectoralis muscles; carry it in a straight line along the sulcus, paralleling the inner border

of the deltoid to the lower border of the pectoral fold, where it terminates in the arm.

(2) Carry this incision deep enough to expose the fibers of the pectoralis major near its tendinous insertion in the humerus.

(3) The index finger is now shoved beneath the head of the pectoralis major muscle and brought out on the upper border.

(4) The muscle is thus separated by blunt dissection from its insertion and its tendon divided.

(5) On the spontaneous retraction of the divided muscle, the underlying pectoralis major muscle is brought to view and similarly treated.

(6) The auxiliary space thus brought to view is cleaned out.

(7) The original horizontal skin incision is now continued by being carried over the chest, defining the outer half of the ellipse, which should parallel the original incision and thus permit the flap to be raised and turned toward the clavicle. Practically all the skin of the breast lying within 3 or 4 inches of the tumor mass is sacrificed.

(8) Place a small tenaculum forceps at each angle of this flap when it is completed.

(9) Complete the dissection with gauze, loosen the tissues under the pectoralis muscles beneath the breast, and separate the remaining attachments of the muscles.

(10) Permit the breast to drop back into its normal position, complete the skin incision around the lower zone and remove the breast with the muscles.

(11) The quadrilateral flap is brought down, stretched out by tenaculum forceps, and made to cover the defect in the chest wall, after which it is sutured to the approximating skin margins.

Results of Complete Extirpation of the Breast and Glands for Carcinoma.—Bloodgood analyzes 464 cases of primary carcinoma of the breast that have been admitted to the Halstead clinic at Johns Hopkins Hospital. Of these 115, or 25.5 per cent., were inoperable, but of these 72, or 17.2 per cent. of the whole, submitted to partial operation. The ultimate results were ascertained in 210 cases three years or more after complete operation. Of these 42 per cent. had remained well at the end of three years or later. Of these a few developed cancer later than three years after operation, thus reducing the number of cures to 35 per cent., which is just 100 per cent. more than would have been alive if no operation had been done.

The further interesting observation is made by Bloodgood that those of the above cases in which the microscope failed to show involvement of the axillary glands, 85 per cent., remained well three years and more, and 75 per cent. were permanently cured. In a later report, based 232 cases operated upon, 38.3 per cent. were free from recurrence af three years.

Post-operative Treatment Following Extirpation of the Breast Carcinoma.—Prolonged rest in bed is not necessary, and in elde people undesirable, as it tends to hypostatic congestion of the lun With the arm and shoulder thoroughly immobilized surgical rest the parts is secured, even with the patient up and about. I, therefo encourage patients to sit up quite as soon as their general stren will permit, and this is generally greater on the second or third d than it is on the sixth, or even later.

If drainage has been employed the dressings should be changed a the tubes removed the day following the operation. If the case h ceased oozing at the conclusion of the operation, presenting a dry fiel and no drainage has been employed, the dressings are not disturbed f six or eight days.

The arm should be liberated on the third or fourth day. It therefore, important that it should not be included in the dressi proper of the wound in cases in which drainage is not employed. I such cases I have the wound dressed with a long broad bandage passe around the chest and over the shoulders, the latter turns defining figure of eight. After this bandage, thus adjusted, has been secure an additional bandage is passed around all, and over the arm. Whe drainage is employed, and the dressings must come down to remov the tubes, the arm is included in the original bandage.

The sutures are removed on the sixth or eighth day.

My patients generally leave the hospital two days after the suture are out. In exceptional cases, in which the cutaneous tension has bee very great, I keep them longer, and support the parts with adhesiv straps.

Palliative Treatment of Inoperable Cases of Carcinoma of th Breast.—Palliative treatment of inoperable cases is largely medical although instances arise in which material relief can be afforded b surgical means.

Opium and its derivatives are the chief means of affording relie as the disease advances and the pressure from enlarged glands and th ulceration both increase.

In case of ulcerating carcinoma the open surface may be treated wit sterilized dilute acetic acid (boiled vinegar) dressings, the cutaneou margins being protected by some sterilized cerate. Vinegar is an excellent deodorant. Of course, the surface should be irrigated dail with normal salt solution and necrotic patches should be cut awa Potassium permanganate, in 5 per cent. solution, makes an excellen the lower border of the pectoral fold, where it terminates

this incision deep enough to expose the fibers of the
near its tendinous insertion in the humerus.

dex finger is now shoved beneath the head of the pec-
uscle and brought out on the upper border.

scle is thus separated by blunt dissection from its inser-
don divided.

pontaneous retraction of the divided muscle, the un-
is major muscle is brought to view and similarly

iary space thus brought to view is cleaned out.

al horizontal skin incision is now continued by being
est, defining the outer half of the ellipse, which should
al incision and thus permit the flap to be raised and
clavicle. Practically all the skin of the breast lying
es of the tumor mass is sacrificed.

all tenaculum forceps at each angle of this flap when

ie dissection with gauze, loosen the tissues under the
beneath the breast, and separate the remaining at-
nuscles.

breast to drop back into its normal position, com-
sion around the lower zone and remove the breast

rilateral flap is brought down, stretched out by
nd made to cover the defect in the chest wall, after
o the approximating skin margins.

plete Extirpation of the Breast and Glands for
od analyzes 464 cases of primary carcinoma of
een admitted to the Halstead clinic at Johns Hop-
ese 115, or 25.5 per cent., were inoperable, but of
cent. of the whole, submitted to partial operation.
were ascertained in 210 cases three years or more
ion. Of these 42 per cent. had remained well at
s or later. Of these a few developed cancer later
operation, thus reducing the number of cures to
just 10 per cent. more than would have been
had been done.

ng observation is made by Bloodgood that those
[illegible] the microscope failed to show involvement
5 per cent., remained well three years and more,

The principles governing operation are (1) to remove every focus of carcinomatous disease, and (2) to effect such removal, if possible, without disseminating the cancerous infection, whatever that infection may be.

Various procedures have been devised for the purpose; that of Halstead, probably more nearly than any other, exemplifies the application of the principles enumerated. The following description of the operation is by Binnie, who summarized it from Halstead's original article and published it in his own excellent "Operative Surgery."

162. HALSTEAD PROCEDURE FOR COMPLETE EXTIRPATION OF THE BREAST FOR CARCINOMA

(1) The skin incision is carried at once and everywhere through the fat (Fig. 336).

(2) The triangular flap of skin A B C is reflected back to its base line C A. There is nothing but skin in this flap. The fat which lined it is dissected back to the lower edge of the pectoralis major muscle, where it is continuous with the fat of the axilla.

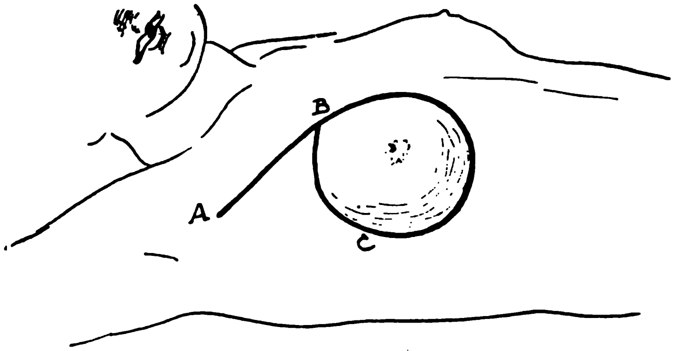


FIG. 336.—(162) HALSTEAD PROCEDURE FOR EXTIRPATION OF THE BREAST FOR CARCINOMA. The incision A B C is here indicated.

(3) The costal insertions of the pectoralis major are severed and the splitting of the muscle, usually between its clavicular and costal portions, is begun, and continued to a point about opposite the scalenus tubercle on the first rib.

(4) At this point the clavicular portion of the pectoralis major and the skin overlying it are cut through hard up to the clavicle. This cut exposes the apex of the axilla.

(5) The loose tissue under the clavicular portion of the pectoralis major is carefully dissected from this muscle as the latter is drawn

Sarcomata grow from subcutaneous, intermuscular, submucous, and glandular tissues.

For the present purpose we shall consider this variety of neoplasm as it occurs in (a) the vulva, (b) vagina, (c) uterus, (d) Fallopian tubes, (e) ovaries, (f) urethra, (g) bladder, (h) kidney, (i) the rectum, and (j) the breast.

PATHOLOGY OF SARCOMATA OF THE VULVA

The number of cases of this kind which have been reported is very small. These connective-tissue neoplasms are, as a rule, very malignant, and there are few well-authenticated cases on record of permanent cure after the removal of a sarcoma of the pudendal organs.

The sarcomata of this region usually present themselves as large spherical tumors arising from the labia, the clitoris, or the region of the external meatus of the urethra, or they may first be observed as deeply pigmented warts on the labia.

There have been described round and spindle-celled sarcoma, myxosarcoma, and melanosarcoma.

Winckel, among ten thousand female patients, saw only two cases of sarcoma of the vulva. One case was that of a pregnant woman, twenty-five years old, with a tumor the size of a man's head, which was hanging down from the vulva, suspended on a pedicle the size of a child's arm. This tumor had not been very malignant, since it had been present and growing for eight years. Its microscopic examination showed it to be a round-celled sarcoma. Winckel's second case was a myxosarcoma. Bruhn operated in two cases of fibrosarcoma, and claims that he obtained a permanent cure. Wernitz reported a case of spindle-celled sarcoma. Robb has described a myxosarcoma. Ehrendorfer has seen a small round-celled sarcoma springing from the anterior part of the meatus urinarius and protruding between the labia. Older reports have been furnished by G. Simon and a few others. Somewhat more numerous are the reports of cases of melanosarcoma. It is a well-known fact that the vulva is frequently the seat of pigmented spots and pigmented nevi. These occasionally become the starting point of melanotic sarcoma, which is generally of a most malignant type. Other melanosarcomata of this region do not begin in superficial pigment spots or nevi, but in the deeper layers of the mucous membrane. They are first noticeable as a purplish spot, which spreads, becomes deeper in color, and then assumes the shape of a simple wart or of a branched papillomatous growth. Haeckel reported a melanosarcoma of a deep bluish-black color springing from the labia minora and the clitoris. Müller described a tumor of this kind arising from the clitoris. Most cases with a broad base, but it tends to become polypoid as the disease advances. It is generally of a cherry-red color, but it may be dark brown if very vascular. Soon the surrounding mucous membrane becomes infiltrated, and here and there in the surrounding structures secondary nodules begin to develop. Sarcoma shows a marked tendency to infiltrate the vesicovaginal septum and invade the bladder, and may, from pressure on the urethra, or infiltration of the neck of the bladder, cause urinary stasis with resulting dilatation of the bladder and hydronephrosis. In advanced cases the tumor is very prone to undergo ulceration or necrosis with resulting infection of the genitourinary tract, which ultimately reaches the kidneys, terminating in pyelonephritis. Rarely the infection may extend to the uterus, and even to the peritoneal cavity. The rectovaginal septum may also be involved.

Metastasis to distant parts of the body has not been observed, though regional metastasis to the inguinal glands and ovary has been met with.

Histologically the tumor may consist largely of connective tissue, or it may assume the type of myxosarcoma. The sarcomatous element may consist of round or spindle cells, or both may be present. Occasionally giant cells are observed, and not infrequently striped muscle fibers are to be seen. According to Kolisko, striped muscle fibers are usually present, but other observers have failed to confirm this view.

The *etiology* is unknown. However, since it begins in infant life, Veit regards it as probable that, in some cases at least, it is congenital. Kolisko also regards the presence of striped muscle fiber as evidence of congenital origin.

(b) Sarcoma of the vagina in adults belongs to the rarer tumors. Up to 1901 Herzog had been able to collect but 31 reported cases. These growths have been observed between the ages of fifteen and eighty-two, though the larger proportion has occurred in persons under forty years of age. They most frequently grow from the anterior wall, and are rather more frequent in the lower third of the vagina. They appear as more or less circumscribed tumors, which is the most common form, less frequently as a diffuse infiltration of the mucous membrane of the vagina, which tends to ulceration. In the circumscribed form the tumor is usually smooth, rounded or hemispherical in shape, and sometimes is encapsulated. The integrity of the mucous membrane covering the tumor is usually maintained until pressure from its increasing size produces ulceration. Metastases to distant parts of the body have been observed, notably to the lungs and skin.

Of the *etiology* of these tumors we know as little as of sarcoma in general. They usually have their origin in the perivaginal connective tissue, or in the submucosa. Occasionally they originate in the blood or lymph vessels, when they are termed endothelioma. Cases of this kind have been reported by Klein, Kalustow, and Waldstein.

The vagina may be secondarily involved by sarcoma, which primarily has its seat in some other region of the body, as, for example, the uterus. Especially is this so in sarcoma of the cervix, where secondary involvement of the vagina is almost the rule.

PATHOLOGY OF SARCOMATA OF THE UTERUS

Sarcoma uteri is a malignant neoplasm having its origin in the connective tissue of the uterus, and is characterized by an atypical proliferation of connective-tissue cells in a slender fibrous stroma.

It occurs less frequently than carcinoma of the uterus.

The first case was described by Mayer in 1860, the diagnosis being confirmed by a microscopic examination of the specimen by Virchow; but nine cases were recorded during the next eleven years. Since that time, however, much attention has been given to the subject, and the condition has a definite place in pathology and surgical therapeutics.

Sarcoma of the uterus is not a disease of relatively frequent occurrence. Franqué reports only 16 sarcomata to 304 carcinomata of the uterus out of 3,366 cases seen during ten years at the Würzburg gynecological clinic.

It occurs, as a rule, in middle and later life, but there have also been reported some cases in very young children. From statistics since accumulated it is estimated to form only 2 per cent. of all uterine tumors and a little less than 5 per cent. of all malignant tumors of the uterus. It may develop primarily in the mucous membrane or in the muscular coat. Its seat may be the vaginal portion of the cervix, the cervix proper, or the body. The latter is more frequently the seat of sarcoma than the other parts of the womb. Sarcoma of the mucous membrane forms flat, irregular, roundish, or polyp-like masses. In some cases the malignant new growth may spring from a small circumscribed spot and form a growth which macroscopically cannot be distinguished from an ordinary polypoid hypertrophy of the mucous membrane. It is of practical importance to keep this in mind, because there are several examples on record where such harmless-looking polyps were removed, a microscopic examination not being made. Shortly after removal, quite unexpectedly, a rapidly growing malignant sarcoma made its appearance. Microscopic examination of such polyps will, of course, reveal their nature.

Sarcomata of the uterine mucous membrane are, as a rule, quite soft in consistence, and have a tendency to spread rapidly. They may develop in the uterine cavity, and even become pedunculated, as shown in a case of my own, of which Dr. George E. Jones made a sketch (Fig. 341). They then infiltrate the muscularis diffusely, and, when at the same time superficial sloughing takes place, as it frequently does, one is not able to ascertain definitely whence the malignant neoplasm originally started.

A peculiar form of sarcoma of the uterus is one sometimes found arising from the cervix. These sarcomata are of a papilliferous type, and, since the papillæ are hypertrophic, the whole growth looks very much like a hydatid mole. Primary sarcoma of the uterine wall generally begins as multiple nodules or roundish masses. It likewise usually rapidly infiltrates the muscularis and the mucosa, and soon leads to destructive processes in the latter. These malignant connective-tissue tumors, when growing in the uterus, frequently have the tendency to close the os internum in a valve-like manner. This leads to one of the constant objective symptoms of sarcoma of the uterus, namely, periodical discharges of an accumulated bloody-watery fluid. Sarcoma of the uterus spreads by continuity and not infrequently leads to a marked enlargement of the uterus in all its dimensions. There may, however, also occur a thinning of the uterine wall with inversion. Such a case has been reported by R. Williams. Distant metastases sometimes take place. Secondary sarcomatous degeneration of primarily benign myomata has been mentioned above.

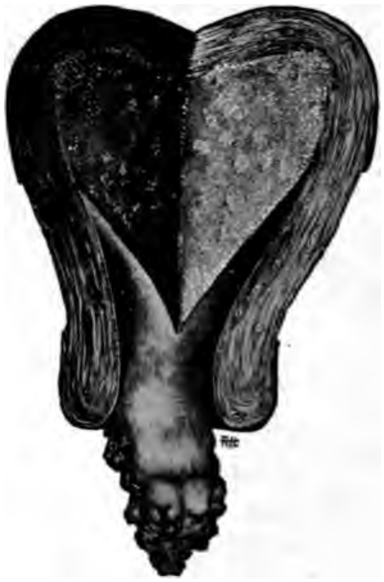


FIG. 341.—SARCOMA OF THE UTERINE CAVITY, WITH POLYPOID DEVELOPMENT AND NECROSIS OF THE EXTRUDED PORTION.

The *histology of sarcoma uteri* is that of these malignant connective-tissue tumors in general. Herzog has described a sarcoma of the uterus showing a number of interesting histologic features, among them numerous atypical karyokineses and the presence of a large number of phagocytic cells. These, which are not to be confounded with leukocytes, are large tissue cells in the interior of which lymphocytes, leukocytes, and red blood corpuscles, intact or in various stages of dissolution, are found.

Secondary degenerations in sarcoma of the uterus are usually marked and appear quite early. Hemorrhage is one of the most constant occurrences, and it leads to the destruction of the neoplastic tissue. Besides such apoplectic destruction we find fatty, hyalin, and colloid degeneration.

Endotheliomata of the Uterus.—Our knowledge of endothelioma, a variety of sarcoma, of the uterus is still very meager. Cases have been reported by Amann, Braetz, Gebhard, Grape, McFarland, Pick, and Veit. These malignant tumors, in their macroscopic characters, are similar either to the sarcomata or to the carcinomata. The cases reported occurred in women between the ages of eighteen and fifty-two years. The endotheliomata take their origin from vascular or lymphatic endothelial cells, and are more or less alveolar in structure.

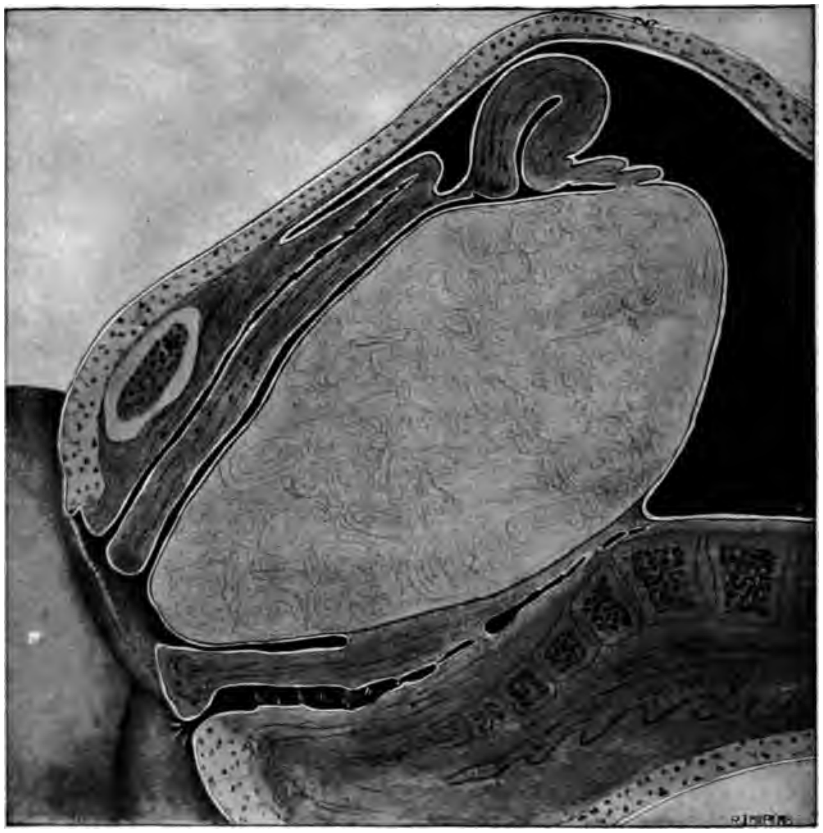


FIG. 342.—RETROPERITONEAL SARCOMA THAT LIFTED THE UTERUS AND APPENDAGES NEARLY TO THE UMBILICUS.

The researches of Kleinschmidt and Kahlden indicate that sarcomata may arise from the connective-tissue elements of the blood vessels and lymphatics in the parenchyma of the uterus; while Virchow, Rokitansky, and Schröder recognize that fibromyomata may undergo sarcomatous degeneration (see Fibromyomata). There is abundant evidence, however, that sarcomata, originating in the parenchyma and abounding in round and spindle-celled elements, may possess sufficient fibrous stroma to give them a consistence by which they may be mistaken for fibromata. The so-called "recurrent fibroids" belong to this class. Some of them grow to enormous size. A case reported by Ott, which had been operated upon by Lebedeff three years previously and was followed by apparent cure, developed a retroperitoneal tumor which lifted the uterus nearly to the umbilicus. I operated upon a similar case in the Cincinnati Hospital (1900); the tumor, which was distinctly sarcomatous, was retroperitoneal, occupied the whole pelvis, and lifted the uterus quite to the umbilicus. After the removal of the tumor with the uterus the latter seemed relatively small as it was seen perched upon the mass (Fig. 342).

PATHOLOGY OF SARCOMATA OF THE OVARY

Sarcoma of the ovary, according to Rothrock's researches, is of much less common occurrence than carcinoma. Cohn estimates the frequency as compared with ovarian cysts at 1 per cent., and as constituting 10 per cent. of malignant tumors of the ovary. On the other hand, Pfannenstiel, in 400 ovariotomies, found sarcoma of the ovary in the proportion of 5.38 per cent. With these, however, he included endothelioma.

Primary sarcoma of the ovary may occur at any period of life, in childhood as well as in advanced age, and Doran has observed it involving both ovaries of a seven months' fetus. It appears to be more frequently met with, however, between the ages of twenty and thirty. It is frequently bilateral, though, as Heinrichs observes, this may sometimes be the result of metastasis, only one ovary having been primarily involved.

Sarcoma belongs to the solid tumors of the ovary, and is usually rounded or cylindrical in shape, with a smooth surface, though it may be irregular in contour, presenting a nodular appearance.

The size of the tumor varies, and it may sometimes reach a weight of 20 to 30 pounds or more, if left to run its course without surgical intervention. Usually, however, the presence of the tumor is manifested by symptoms before it attains a great size.

The consistence of the tumor depends upon its histologic structure. If made up largely of spindle cells it will be firm, resembling fibroma, whereas, if composed chiefly of round cells, it will be soft and often of brain-like consistence. Frequently these tumors contain much fibrous tissue, when they are called fibrosarcomata.

Usually the entire ovary is replaced by the tumor mass, though occasionally the remains of ovarian tissue may still be seen on its surface. The tumor is commonly surrounded by an outer wall, which is in many instances so thin and delicate that the fingers may be thrust through it. These tumors are usually attached by a short pedicle, and are seldom adherent to the neighboring viscera, but are frequently accompanied by ascites. On section they present a yellowish-white, gray, or pink surface, the color depending on their structure and blood supply. Cyst formations are by no means infrequent, and are usually the result of hemorrhagic infarcts or extravasations of blood into the tumor substance with subsequent softening, or of fatty degeneration of the tumor cells.

Histologically sarcoma consists of a diffuse infiltration of the ovarian stroma by sarcoma cells, the variety most commonly found being round or spindle cells. Frequently both round and spindle cells are present in the same tumor.

In the order of malignancy the small round-celled variety stands first, while fibrosarcoma appears in many instances to be relatively benign.

Rothrock has observed a case of spindle-celled sarcoma involving both ovaries, in which the patient died of metastasis of the peritoneum six months after operation for their removal.

Metastasis of other organs of the body occurs, according to Temesvary, in the following order of frequency: the peritoneum, omentum, stomach, pleura, lungs, uterus, liver, diaphragm, kidney. Sarcoma of the ovary frequently undergoes degenerative changes, the most common of which are myxomatous and fatty degenerations.

Endothelioma of the Ovary.—This is a form of sarcoma originating from the endothelium of the blood vessels of the ovary, and is presented under this subheading because of its interesting histologic characteristics.

Leopold first in 1874 described a case under the name of lymphangioma cystomatosum. Tumors of similar structure had, previous to this, been frequently observed occurring in other regions of the body, and were called angiosarcoma and lymphangiosarcoma.

Marchand in 1897 was the first to give a detailed description of these tumors, and to distinguish them from both carcinomata and sarcomata, in spite of the great similarity in many respects to the structure of both. He named them endotheliomata, thus denoting their origin from the endothelium of the blood or lymph vessels. Since then tumors of the same kind have been described by different authors, so that we may now form some conclusions concerning the most important features of these growths.

Endothelioma of the ovary is, in most instances, a solid tumor. It has been met with most frequently in middle age or beyond it, though Leopold has observed it in an eight-year-old girl, and Olshausen in a girl seventeen years of age.

These tumors vary in size from that of a closed fist to that of a man's head, and are usually unilateral, though bilateral tumors have been observed. In shape they are commonly rounded, or they may be multinodular or lobulated. The surface of the tumor may be smooth or rough, and its consistence firm or soft. Usually the tumor is attached by a short pedicle, and it frequently forms adhesions to the surrounding structures.

On section the cut surface is of a yellow, gray, or white color, often brain-like in appearance and consistence, and easily torn by the finger. Frequently it is made up largely of fibrous structure, in which are present nodular areas of softer consistence. Again the tumor may be composed of numerous small cysts in a rather dense stroma, thus giving it a honeycombed or worm-eaten appearance (Pick). In other instances the tumor appears cavernous, or may be laminated in structure. Cyst formation occurs chiefly in the lymphatic variety. Rarely papillary formations have been observed within the cyst, the histologic structure of which is fibrous. These tumors have their origin in the endothelium of the blood and lymph vessels, and histologically they present the greatest variety of structure.

Pick has distinguished three types:

(1) A rosary-like form consisting of chains of cells arranged in rows, lying in narrow spaces or clefts in the stroma; their borders run parallel and they frequently anastomose with each other or send off branches.

(2) The second consists of gland-like formations, which on transverse section furnish a picture often difficult to distinguish from adenocarcinoma, as the lumen of the gland-like spaces is often encroached upon by several layers of polymorphous cells.

(3) The third form consists of a histologic formation resembling alveolar sarcoma, and appears as groups of rounded epithelioid cell bodies filling alveola-like spaces in the rather dense fibrous stroma. Not infrequently all three types may be found in the same tumor.

Endothelioma is frequently found in combination with other tumors of the ovary. The cases of Eckhard, Flaischlen, and Pomorski were cystic and contained dermoid structures, while Pfannenstiel has observed a combination of endothelioma with true epithelial cystadenoma. They are very prone to undergo degenerative changes, the most common being hyalin and myxomatous degeneration, while colloid and fatty degeneration have also been observed.

Clinically they are malignant. In a case of Leopold's, which was unsuited to operation, the patient died of cachexia within six months.

As regards recurrence following operation, there are only scanty data available upon which to base an opinion. Of 7 cases tabulated by von Velits only 2 recovered from the operation. In 2 cases metastasis was observed, while 4 had pronounced cachexia. Billroth regarded these tumors as in the same order of malignancy as carcinoma.

PATHOLOGY OF SARCOMATA OF THE BLADDER

Sarcoma of the bladder is comparatively rare, and is as liable to occur in women as in men.

It may occur at any age, although about thirty-five per cent. of all cases occur before the tenth year.

The base, trigone, and posterior wall are more frequently involved, although the disease may originate in any point of the bladder.

The growths may be single or multiple. They are sometimes pedunculated, but more generally sessile, and tend to infiltrate the walls of the bladder.

They may spread by contiguous invasion of structures until they involve the peritoneum, urethra, and even the pubes. They are hemorrhagic within themselves, and when they begin to break down, as they do very early, the blood escapes directly into the bladder.

PATHOLOGY OF SARCOMATA OF THE KIDNEY

Sarcomata of the kidney arise from the connective tissue, develop and present the general histologic characteristics already enumerated.

They are divided according to their histologic peculiarities, but more particularly according to their origin, into simple angiosarcoma, vascular endothelioma, lymphatic endothelioma, and perivascular sarcoma. The characteristics of these varieties have already been discussed in this chapter.

The only additional variety of sarcoma that requires attention in this connection is that known as *hypernephroma*. This is the most frequent of malignant tumors of the kidney.

The histogenesis and the histologic peculiarities of this condition have been matters of long dispute. Wilson, after a careful study of the literature and of ample material afforded by the Mayo clinic, concludes:

(1) Most, if not all, so-called "adrenal rests" are probably of Wolffian origin.

(2) There is almost no evidence, embryologic or histologic, in support of Grawitz's hypothesis that the so-called "hypernephromata" have their origin in adrenal rests.

(3) There is much evidence that the so-called "hypernephromata" do not arise (according to Stoerk's hypothesis) from proliferations of the adult secreting epithelium of the convoluted tubules.

(4) There is much evidence that the so-called "hypernephromata" do arise from islands of nephrogenic tissue (primitive renal blastema). Such tissue is sometimes present in the adult kidney, and appears capable of forming tumors of the non-infiltrating, mixed-cordon, tubular, papilliform, and sarcoma type so characteristic of the so-called "hypernephromata."

SYMPTOMS AND DIAGNOSIS OF SARCOMATA

SYMPTOMS AND DIAGNOSIS OF SARCOMATA OF THE VULVA

The growth may appear as a nodule seated more or less deeply in any of the vulval structures. It grows rapidly, is generally soft and easily compressible, and is neither tender nor painful. It is liable to be taken for a lipoma, which is more common in this locality, but which is not of rapid growth. When sarcomata are near the surface they are prone to break down, when their surfaces speedily ulcerate, become ecchymotic, and will not heal. An ulcerated sarcoma presents retracted and everted margins with an extruding central area made up of redundant round cells, in which there is little or no stroma, and which bleeds at the slightest touch. Microscopic examination of a section of the growth establishes its character.

SYMPTOMS AND DIAGNOSIS OF SARCOMATA OF THE VAGINA

The diagnosis of vaginal sarcomata is based entirely upon the characteristics of these growths already given in connection with their pathology.

SYMPTOMS AND DIAGNOSIS OF SARCOMATA OF THE UTERUS

Sarcomata of the uterus are generally smooth oval or pyriform growths. Whether they develop from inside the uterus or from its parenchyma, they tend simply to enlarge the organ without otherwise distorting its lines. It may be said that the sarcomatous uterus is never nodular unless the sarcoma occurs as a degenerative change in a preëxisting myoma. Hemorrhage is an early symptom, and rapid growth another. The condition is liable to be mistaken for pregnancy with placenta prævia, or with a tendency to abortion. The diagnosis in such instances is always difficult to make, sometimes even after the abdomen has been opened and the uterus lifted upon the surface.

[illegible] diagnostic purposes, [illegible] in an abdom[illegible] [illegible] ns.

SYMPTOMS AND DIAGNOSIS OF SARCOMATA OF THE OVARY

[illegible] shape and are very [illegible] growth. These two [illegible] true character. A differential [illegible] and delay for that purpose is only a source of danger to the patient. Every growing tumor within the pelvis or abdomen should be removed. Its pathologic characteristics can be determined afterward.

SYMPTOMS AND DIAGNOSIS OF SARCOMATA OF THE BLADDER

Hematuria occurs as the first symptom in over two-thirds of the cases. It is the result of rupture of the numerous small vessels that are unsupported by stroma. It is provoked by violence in even ordinary exertion.

Pain is not an initial symptom, except in rare cases, in which the early growth is situated low down and interferes with the function of the bladder.

Frequent urination with tenesmus may come on early, but is always present at some stage of the case.

Cystoscopic examination often fails to reveal the condition, which is generally obscured by blood, the free flow of which is provoked by [illegible].

[illegible] advances tumefaction of the bladder occurs. This [illegible] suggestive of a distended bladder, which, how[illegible]

[illegible] upon the circulation and [illegible] the hemorrhagic pro[illegible]

SYMPTOMS AND DIAGNOSIS OF SARCOMATA OF THE KIDNEY

[illegible]

TREATMENT OF SARCOMATA

The treatment of sarcomata divides itself into (a) radical, (b) medicinal, (c) palliative.

SURGICAL TREATMENT OF SARCOMATA

The radical treatment consists in the early and complete removal of the growth or growths. This is not always practicable, even in such accessible localities as the vulva and vagina, for here rather than in other structures sarcomata tend to rapid development and early metastases.

Whenever the growth is yet circumscribed and movable it ought always to be excised, care being taken to remove all the capsule.

A rapidly growing uterine tumor ought always to be removed without reference to its histologic character.

The same rule applies to solid tumors of the ovary.

In many cases of sarcomata of the bladder hemorrhage calls attention to the condition while the tumor is yet small and sometimes pedunculated. In such cases the growths should be removed without delay. This may be done by either the urethral or vaginal routes, or by opening the bladder above the pubes.

(a) Removal through the urethra may be accomplished by either of two methods:

(1) The urethra may be dilated, a large cystoscope (Kelly) introduced, and the tumor removed piecemeal with the alligator forceps, and the pedicle treated with strong styptic.

(2) The Oudin current from a high frequency machine is used and the growths broken down by fulguration.

The operating cystoscope of Nitze may be employed. Nitze insists, however, that this use of his instrument should be restricted to benign growths. Casper, however, used it with the galvanocaustic snare in thirty cases, all of them successful. He speaks of the slight hemorrhage following this form of removal.

(b) Removal through the vagina is effected by means of an artificial vesicovaginal fistula, by which the interior of the bladder is exposed and the growths treated with either the electric or Paquelin cautery (for technique see Surgical Exploration of the Bladder under Carcinomata).

(c) Removal by suprapubic operation may be accomplished by any of the methods described for similar treatment of carcinoma of the bladder (q. v.). If upon exploration it is found that there is limited involvement of the wall, the area thus involved should be removed with the growth (partial cystectomy).

(d) Removal by total cystectomy (for technique see Cystectomy under Carcinomata of the Bladder).

Relative to this procedure for sarcomata Guiteras very justly observes that "the results are very unsatisfactory, and, unless the technique is improved, it cannot be recommended."

Sarcomata of the kidney and hypernephromata are to be treated only by extirpation undertaken as soon as the diagnosis is made (for technique see Nephrectomy under Injuries).

The surgical treatment of sarcomata in general is so unsatisfactory, barring pedunculated growths of the vulva and bladder and hypernephromata, that it is a serious question whether or not they should be subjected to some other form of treatment that may offer a logical prospect of cure.

THE TOXIN TREATMENT FOR INOPERABLE SARCOMATA IN GENERAL

Coley inaugurated the treatment of inoperable sarcoma by the hypodermatic injection of the mixed toxins of erysipelas and *Bacillus prodigiosus*.

Relative to the *modus operandi* of this treatment Coley states (1911):

"While I have not been able to prove the exact way in which the bacterial toxins exert their inhibitory influence upon the neoplastic cells, I have, nevertheless, given a great deal of thought to the question. This action, as I have already pointed out on numerous occasions, does not by any means produce a direct toxic or necrotic effect upon the tumor cells, but is systemic, as is proven by the fact that a very large number of the successful cases have been treated solely by systemic injections. It may be possible in the future to determine the exact nature of these changes in the blood serum which have produced the effects described. It is possible that we are dealing with some of the complicated questions of immunity. The toxins may produce antibodies which render unfavorable the conditions for the life and further growth of the tumor cell. Just how delicately balanced are these neoplastic cells is shown by the recent experiments of Carrel, of the Rockefeller Institute, according to which sarcoma cells may be grown outside of the human body from the blood plasma of the patient when all the conditions are favorable, but the slightest infection is sufficient to destroy this delicate balance between the life and death of the tumor cell."

With respect to his final results, Coley states:

"Up to the present time I have had sixty-five cases of inoperable sarcoma in which the tumors disappeared under the use of the mixed toxins of erysipelas and *Bacillus prodigiosus*. The utmost efforts have been made to trace the after-histories of these cases, with the following results:

"Seven remained alive and well at the end of 15 to 18 years.

"Seven remained alive and well at the end of 10 to 15 years.

"Seventeen remained alive and well at the end of 5 to 10 years.

"Ten remained alive and well at the end of 3 to 5 years.

"That is, 41 cases remained well from 3 to 18 years, or 31 from 5 to 17 years.

"As to the correctness of the diagnosis in these cases, they were practically selected cases, i. e., selected by the leading surgeons of America as hopeless, inoperable cases. In all of these cases, with the exception of four, the diagnosis was confirmed by careful microscopical examination, in most cases not by one, but by several, of the most competent pathologists.

"In order to still further eliminate all chance of error in diagnosis it may be pointed out that, in a large number of the cases, there was a history of very rapid growth and repeated recurrence after operation.

"If further evidence were needed it is furnished by a small number of cases in which, after the complete disappearance of the tumor under the toxin treatment, the disease afterward recurred locally and generally, and caused the death of the patient."

The unsatisfactory results of surgical treatment of sarcomata justify a fair trial of the Coley treatment.

THE PALLIATIVE TREATMENT OF SARCOMATA

The sarcoma may so develop as permanently to obstruct the urethra. In such cases urinary drainage can readily be established. If a ureter, or, for that matter, both become permanently obstructed, nephrostomy with permanent urinary fistula in the lumbar region can be done to mitigate the excruciating pain. Anodynes are called for and euthanasia is justifiable.

CHAPTER V

ADENOMATA OF THE FEMALE GENITOURINARY ORGANS

Adenomata occur in (a) the vulva, (b) the round ligament, (c) the uterus, (d) the Fallopian tube, (e) ovary, (f) the kidneys, (g) mammary glands, and (h) rectum. Only a few of these manifestations are of clinical importance in connection with this work.

Pure adenomata are neoplasms that grow from an epithelial surface and have the structure of secreting glands, but without functions or ducts.

They are benign. When growing from the interior of a gland they are generally encapsulated; when growing from cutaneous or mucous surfaces they are warty in form and usually pedunculated.

Mixed adenomata, while preserving their original type, may possess myomatous tissue (adenomyoma) or cellular tissue elements (adenosarcoma) or cystic formations (adenocystoma).

Histologically these growths, whether pure or mixed, conform in general features to the structures from which they are derived.

They are subject to degenerative changes generally caused by traumatism or infection.

ADENOMA OF THE VULVA

This condition is of very rare occurrence. When it does occur it is derived from the rudimentary sweat glands of the pudendal integument. Pick has seen two cases in Landau's clinic. Here, as elsewhere on the cutaneous surfaces, there are small growths, warty in character, pedunculated, and varying in size from 0.3 to 0.5 cm. in diameter.

The treatment is by excision, touching the base with the electric cautery.

ADENOMYOMATA OF THE ROUND LIGAMENT

These growths are histologically identical with adenomyomata of the uterus. They are rare, but have been reported by Cullen (1896), Pfannenstiel (1897), Bluhm (1898), and Blumen (1904).

They may develop on either side of the aponeurotic ring.

They may be solid or cystic, and blood pigment may be found in either their cavity or their stroma.

The symptoms are tumefaction and the inconvenience arising therefrom, and the exact diagnosis is always post-operative. They are generally mistaken for omental hernias.

Treatment is exclusively by extirpation.

ADENOMA OF THE UTERUS

ADENOMYOMATA OF THE UTERUS

These growths of the uterus are made up of aberrant glandular structure interspersed with myomatous striæ.

They are classified as (a) diffuse and (b) circumscribed.

The diffuse adenomyomata may occur at any point of the uterine wall, may involve either the entire cervix or the entire body, or both, or, as in the cases of Furth and V. Franqué, they may extend back of the uterine wall to the rectum.

The circumscribed adenomyomata, sometimes called nodular, embrace practically all the cystic tumors of the uterus. They are the so-called fibrocysts of the uterus. They may be very small, measuring only a few mm., or they may extend above the umbilicus.

Cullen's observations would seem to establish the fact that these growths are of endometrial origin. V. Meyer, however, is of the opinion that, according to their location, they may be derived from proliferating epithelium of the serosa from Gartner's duct and from the Wolffian bodies.

These growths are less frequent than fibromyomata. As they are generally of the diffuse variety, the uterus, while enlarged, generally retains its outlines.

The symptoms are practically the same as those of myomata (q. v.), and the differential diagnosis between adenomyomata and pure myomata is practically never made, nor is it important that it should be made before removal.

The treatment is entirely surgical (see Hysterectomy).

ADENOMA MALIGNUM OF THE UTERUS

There is some doubt whether this condition should be considered in connection with adenomata or carcinomata. The doubt seems to be expressed by the fact that many pathologists designate the condition as *adenoma malignum carcinomatosum uteri.*

It is a malignant degeneration of the endometrium possessing individual characteristics, but having a tendency to assume the carcinomatous type.

To Matthews Duncan probably belongs the distinction of first having directed attention to this disease, although at the time of his first report its histogenetic character was not recognized. Breisky and Eppinger reported undoubted cases in 1877, at which date the real literature of the subject commences. Veit was the first to demonstrate that what appeared primarily to be simple, benignant adenoma might become a veritable adenocarcinoma, possessing all the characters of malignancy. In America Thomas and Goodell were among the first to report cases of apparent malignant adenoma, while Mann was among the first to give a clear elucidation of the disease. Coe's contributions to the subject have been of great value.

This neoplasm is looked upon by Herzog as probably not different from a carcinoma of a more common type, although it shows such characteristic histologic features that it is now generally classified separately. Glandular hypertrophy of the uterine mucous membrane may reach a very high degree, so that one might feel inclined to speak of it as an adenoma; and it has been asserted that such extensive glandular hypertrophies have a tendency to change into an adenoma malignum. Yet this assertion so far lacks proof. Typical adenoma malignum of the uterus, as shown in Oliver's case, does not, as a rule, present a well-circumscribed tumor, but a general diffuse thickening of the mucous membrane, which has an irregular, juicy, velvety appearance. The uterus is generally moderately enlarged in all its dimensions. In very high degrees of glandular hypertrophy we find the uterine glands often quite tortuous, divided twofold or threefold, and invaginated upon themselves. In adenoma malignum the picture becomes still more complicated. The rapid proliferation of the glandular epithelium leads to one of two conditions. Either the newly formed epithelia grow toward the lumen of the gland, and in their growth carry inward toward the glandular axis the basement membrane, *adenoma malignum invertens*, or they grow outward, away from the axis, and then an *adenoma malignum evertens* is formed. Of course, these two types may be more or less combined. It is not easy to form a clear conception of the microscopic picture of these tumors, even from a very minute description. Gebhard, describing them in detail, states that nobody, even after studying a full description, should imagine himself able to distinguish every adenoma malignum from a glandular hypertrophy. Only a good deal of microscopical experience can give safety in this respect.

Herzog, who has examined several cases of adenoma malignum, saw one among them which was operated on by Henrotin and which showed a very interesting histologic combination. The uterine mucosa showed the typical picture of an adenoma malignum, except in those parts where the tumor had extended into the cervix. Here were found regular, solid, alveolar cell nests, and it appeared that the epithelia were squamous in character. Herzog believes that there existed primarily an adenoma malignum of the corporeal mucosa. The malignant process secondarily infected the cervical mucosa, where it localized itself in squamous epithelia present there, either by a process of metaplasia or by one of substitution.

Symptoms and Diagnosis.—The symptoms of adenoma uteri are not clearly defined, none of them being characteristic of the disease. The first fact of importance is the relative chronicity, adenoma being the least active of the various malignant degenerations of the uterus. The patient will, therefore, give a history covering a longer period of time than would be the case if she were afflicted with carcinoma. Coe maintains that there is less pain, that the hemorrhages are less frequent and less profuse, and that the intervening watery discharges are less offensive than in carcinoma. The disease is not prone to metastatic manifestations, which occur late, if at all. They were entirely absent in four of Coe's cases. The diagnosis depends upon the symptomatology above indicated, and upon the detection of papillomatous growths in the interior of the uterus. If uterine scrapings are examined by the microscope the result is likely to be negative, which would not be true if the disease were carcinomatous. Adenoma is an insidious disease that runs a slow course of invincible malignancy. It is important that the relative good health sustained through a long period by patients with this disease should not be construed as an evidence of even a tendency to recovery. The profuse hemorrhages, the intervening discharges, the pain and tenderness, may disappear for a time, only to return a little later with added violence.

Treatment of Adenoma Malignum.—The treatment, to be on the side of safety, should be arranged without reference to any remaining pathological question relative to the existence, respectively, of benign and malignant adenomata, and should be based upon the axiom of Coe, viz.: "There is only one variety of true adenoma of the corpus uteri, and that is, both clinically and anatomically, malignant." In no other way can a patient be given the benefit of the doubt, at least until the pathologists themselves can distinguish between the two alleged varieties, and can furnish to the practitioner the criteria by which he can tell the one from the other. Repeated curetting is conceded to augment the malignancy of the disease, while the use of the galvanocautery is equally objectionable.

ADENOMA OF THE OVARY

CYSTADENOMATA OF THE OVARY

(Ovarian Tumors)

Cystadenomata are derived from epithelial elements normally in the ovary.

They comprise the majority of all cystic growths of the ovaries, and are the neoplasms known historically as "ovarian tumors." They have been variously known as "proliferating cysts" and "colloid cysts" and "pseudomucinous cysts."

They are most frequently unilateral, but sometimes occur on both sides.

They vary in size from a mandarin orange to over two hundred pounds. Bullitt removed a tumor of 245 pounds; Spohn one weighing 328 pounds. Cartledge reported a case in which the tumor had been growing for thirteen years, and for the last four years very rapidly, so that the patient had been unable to assume a reclining posture for more than a year and a half. The circumference at the umbilicus was 79 inches. The woman was 5 feet 4 inches in height, and well formed, except that she was very much emaciated from carrying this enormous cyst. Twenty-four gallons of ovarian fluid were removed before she was placed in position to be anesthetized. After that she was placed on her back and 10 additional gallons of fluid withdrawn. The adhesions to the anterior parietal wall were terrific. Many ligatures were used, and the operation consumed about two hours under unfavorable circumstances. The woman survived the operation fairly well, leaving the table with a pulse of 114. On the fifth day she had a normal temperature and a pulse of 108. Beginning with the sixth day symptoms of intestinal obstruction developed, and she finally died. The fluid withdrawn weighed 240 pounds and the sac 5 pounds.

Other very large tumors have been reported, one successfully removed by Gilliam, of Columbus, weighing 176 pounds. A. H. Cordier has reported a cyst which weighed 160 pounds (Fig. 343). Tumors of 100 pounds are occasionally encountered.

It is no longer common, however, to meet with such large cysts, inasmuch as surgical aid is usually sought before the tumor reaches a great size.

They may occur at any period of life from puberty to advanced age, although they are most frequently encountered during the child-bearing period, especially from thirty to forty-five.

Unmarried and sterile women seem to be especially predisposed.

Whether, as has been suggested, pregnancy and lactation by temporarily interrupting the menstrual function afford a protection against tumor formation we do not know. It is conceivable, however, that the periodical congestion incident to menstruation may have a determining influence.

The shape of the tumor is usually spherical, ovoid, or irregular in outline. If small it is usually irregular in shape from partial fusion of two or more cysts presenting no uniformity of structure. Larger tumors, while generally assuming a spherical shape, are often uneven in outline, with here and there nodular prominences due to bulging caused by smaller cysts developing in the cyst wall.

The external appearance of the tumor is pearly white or bluish, often smooth and glistening, and at times it has a cartilaginous appearance. Over the surface blood vessels of varying size are frequently seen ramifying. Occasionally bands of unstriped muscle fiber and the remains of ovarian stroma are to be seen spread out over the tumor, especially near the pedicle.

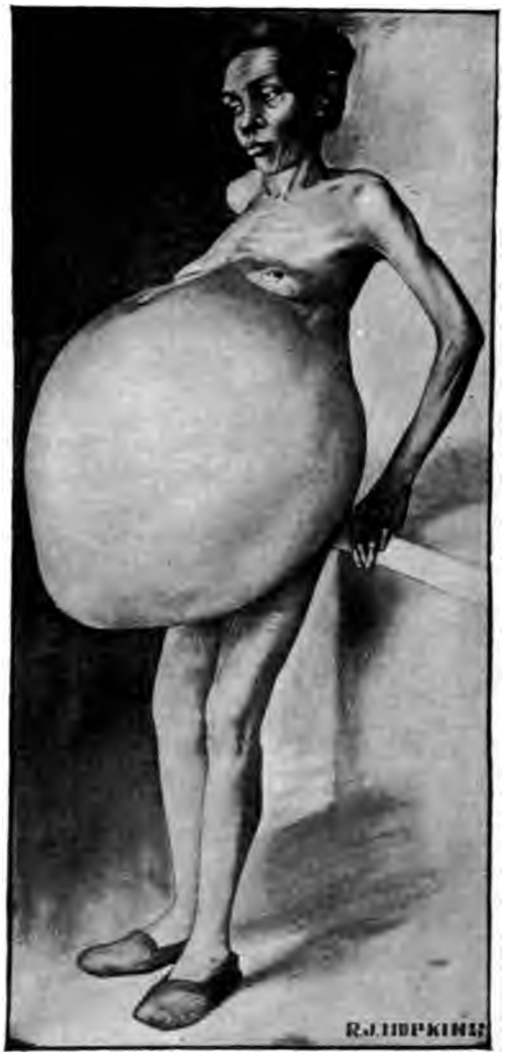


FIG. 343.—CYSTADENOMA WEIGHING 160 POUNDS. (Case of A. H. Cordier.)

On section the tumor, according to Rothrock, will be found to consist of a conglomeration of a greater or less number of cysts (Fig. 344). Usually one attains a considerable size and constitutes the main portion of the tumor, while in its wall are developed numerous smaller cysts which encroach on the lumen of the main cyst. Sometimes the en-

[illegible] innumerable sm
[illegible] structure, givi
[illegible] individual cy
[illegible] mass compos
of [illegible] septa frequently b
[illegible] rupture, resulting
[illegible] cavities. Frequent
the remains of su
septa may be seen i
the main cyst, formin
ridge-like proce
ses on its internal su
face. Gradually thes
septa disappear fro
pressure, and in old a
very large cysts the en
tire tumor may co
sist of one larg
space, though usuall
smaller flattened cy
tic spaces will b
found in its wall
The internal surfa
of the cyst is usuall
smooth, though it ma
be covered here an
there with wart-like excrescences, [illegible], or cauliflower growths. These may be few or quite abundant. As a rule, the larger the cyst the smoother will be its wall, and the fewer papillary growths it will contain. These papillary growths differ much in appearance. They are usually of a gray color, but may be pink or dark red if rich in blood vessels.

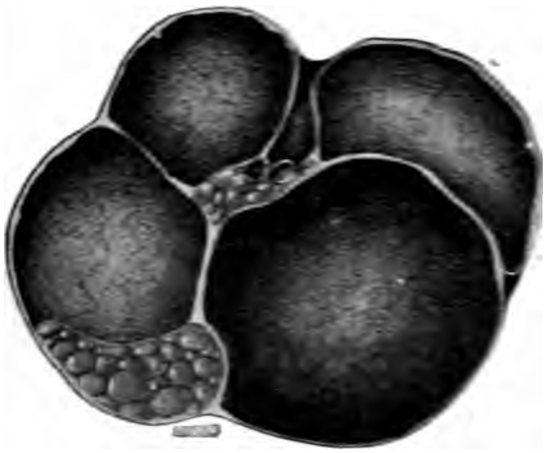


FIG. 344.—CYSTADENOMA ON SECTION, FOUND TO CONSIST OF A CONGLOMERATION OF A GREATER OR LESS NUMBER OF CYSTS (MARTIN).

The cyst contents are the product of cell secretion from the lining membrane. The contents of the individual cysts composing the tumor may present the greatest diversity of appearance and consistence; one obtained by Pfannenstiel contained a bright transparent body, probably a degenerated ovum. In general they consist of a fluid with a specific gravity of from 1.010 to 1.030, of the consistence of honey, though at times it may be thick, ropy, and gelatinous, especially in the smaller cysts.

In color it varies quite as much as in consistence. It is usually turbid, and often has the appearance of oily water; it may be gray, yellowish, greenish, or wine-color, and sometimes it is dark brown from admixture of blood.

Microscopically it is usually poor in organized elements, being composed chiefly of a homogeneous mass which may contain a few fat globules, degenerated epithelial cells, and at times a few red blood corpuscles, hematin and cholesterin crystals.

The cell described by Drysdale and considered by him a pathognomonic sign of ovarian cysts is no longer so regarded.

The greatest interest attaches to the chemical constituents of the cyst contents. They usually consist of a highly albuminous fluid which contains in addition a peculiar substance named pseudomucin. This substance varies in amount in different cysts, sometimes constituting almost the entire cyst contents, and again it is present only in small quantities. Small cysts with colloid-like contents are the richest in this substance. Pseudomucin is a glycoproteid, and differs from mucin in not being precipitated by acetic acid. It is further characterized by setting free a copper-reducing substance when boiled in the presence of dilute mineral acid.

The following is the *test for pseudomucin* proposed by Pfannenstiel, and is a modification of Hammarsten's test: To a portion of the cyst contents add twice its volume of alcohol, after which shake the mixture well. Filter and wash the precipitate well with alcohol, after which press gently between filter papers to remove the excess of alcohol. A portion of the precipitate is then boiled for half an hour in a 10 per cent. solution of hydrochloric acid. After cooling treat with phosphor-wolfram acid until the albumin is entirely precipitated. Filter and test the filtrate with Trommer's or Fehling's test for sugar, and, if reduction takes place, it may be concluded that pseudomucin is present.

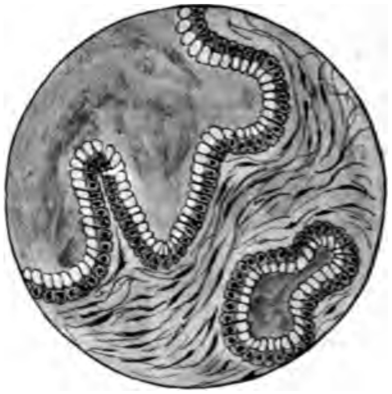


FIG. 345.—CYSTADENOMA OF THE OVARY. Epithelium of a pseudomucinous cyst. (Whitacre.)

Histologically the wall of the cyst is made up of three layers. The outer represents the tunica albuginea of the ovary, and is covered with germinal epithelium consisting of a single layer of low cylindrical cells. The middle layer consists of connective tissue and may contain ovarian stroma or smooth muscle fibers. This layer also contains the larger blood vessels. The inner layer consists of cyst epithelium (Figs. 345 and 346) and is covered by a single layer of peculiar mucus-like cells, cylindrical in type. According to Pfannenstiel, these cells show a special affinity for hematoxylon and eosin, and by this double stain the nuclei, cell contents, and periphery are clearly differentiated.

When stained they appear as high cylindrical cells with small basal nuclei, while the cell body consists of a clear transparent mass inclosed within the cell wall, which appears as a faint outline. Occasionally the cyst wall contains small duct-like tubes or glands, which originate in a proliferation and invagination of the cyst epithelium into the wall of the cyst. Frequently, instead of duct-like invaginations, their mouths will have become occluded from constriction of the connective tissue of the cyst wall, which is also in a state of proliferation, when they will appear as small cysts. The constant repetition of this process of epithelial prolifera- [illegible] together with the increasing contents from [illegible] epithelial secretion [illegible] responsible for its [illegible]

[illegible] according to [illegible] in the follow- [illegible] [illegible] takes place [illegible] [illegible] connective tissue [illegible] many instances [illegible] considerable pr-

[illegible]

[illegible] common [illegible]

cysts. In contrast with pseudomucinous cysts, they frequently develop bilaterally. While they may lie free in the peritoneal cavity, attached by a well-formed pedicle, they frequently develop within the folds of the broad ligament, and show a special tendency to become attached to the neighboring viscera by adhesive bands.

On section these cysts are also multilocular, though, as a rule, they seldom contain so many cysts as the pseudomucinous variety. A certain proportion of serous cysts, especially the larger ones, may appear macroscopically as unilocular cysts, but microscopic examination will invariably reveal the presence of small cysts within the walls of the tumor. As a rule, these cysts contain papillary growths, and they represent the type of proliferating papillary cysts of the old classification, just as the glandular type is represented by the pseudomucinous variety. Occasionally, however, serous cysts may be of the glandular type and contain no papillary growths.

Papillary growths may be very abundant, and may completely fill smaller cyst cavities, and even cause rupture by pressure from increased contents, or they may grow through the wall of the cyst, causing perforation. Not infrequently serous cysts are encountered with papillary growths on their surface as well as in their interior. These may grow direct from the germinal epithelium, or may represent a continuation of intracystic papillary growths which have penetrated the wall of the cyst. Such cysts are almost invariably accompanied by ascites.

The contents of serous cysts consist of a thin, clear, straw-colored or greenish fluid, rich in albumin, but containing no pseudomucin. It is partly derived from cell secretion and partly from transudation from the blood vessels.

Histologically the wall of serous cysts, as of pseudomucinous cysts, is composed of three layers, differing only in the inner layer, which is lined by columnar ciliated cells. The papillary growths often present on microscopical section the most picturesque forms, usually consisting of rather scant connective-tissue stalks with branching processes extending in every direction from the main trunk. The epithelium covering the papillary growths is the same as that lining the cyst. Not infrequently deposits of lime salts are seen in the papillomatous growths, often presenting a concentric layer arrangement; they are termed psammomata.

HISTOGENESIS.—The origin of proliferating cysts of the ovary is still a matter of much controversy, although the investigations of many competent observers in recent years, summarized by Rothrock, have done much to throw light upon this obscure subject. Formerly all ovarian cysts were believed to originate in the Graafian follicle. Virchow, after a careful investigation of colloid cysts, concluded that they were of connective tissue origin, the result of colloid degeneration of the stroma of the ovary, and that the colloid mass constituting the cyst contents was the product of degeneration.

The excellent work of Klebs and Waldeyer in determining the epithelial origin of cysts has placed the subject of histogenesis on a firm basis. They advanced the theory that proliferating cysts originated from Pflüger's tubes. More recent investigations have shown, however, that epithelial neoplasms have their origin not in the embryonal Pflüger's tubes, but in tube or gland-like formations occasioned by a tilting in and subsequent invagination of the germinal epithelium into the ovarian stroma, which from the beginning must be regarded as neoplasms. According to Pfannenstiel, this dipping in of the germinal epithelium is not to be considered in the same light with embryonal misplaced epithelium in the sense of Cohnheim's theory, but rather as the result of certain pathologic changes which the germinal epithelium undergoes. Until comparatively recently the germinal epithelium was considered the sole source of proliferating cysts, but evidence begins to accumulate that they may, and often do, originate in the Graafian follicle.

Rothrock is convinced that the careful researches of Flaischlen, Bulius, Steffeck, Frommel, Pfannenstiel, Williams, and others seem to prove beyond doubt that under certain conditions the membrana granulosa of the follicle may undergo pathologic change and be replaced by cylindrical epithelium, from which cysts may develop in a manner analogous to those developing from the germinal epithelium. Williams, after an exhaustive study of the histogenesis of papillary cysts, concludes: (1) that the Graafian follicle is probably the usual starting point of papillary cysts, and, according as the membrana granulosa is transformed into ciliated epithelium or not, so will the cyst be lined with ciliated or non-ciliated epithelium. (2) That the germinal epithelium is perhaps the most frequent source of superficial and multilocular papillary cysts.

On the other hand, Pfannenstiel has shown that serous or ciliated cysts may develop from the germinal epithelium, it having first undergone pathologic change, becoming ciliated; and he regards this as the usual origin of such cysts, while von Velits entertains the view that most ciliated cysts have their origin in the Graafian follicle.

According to Pfannenstiel, pseudomucinous cysts usually originate in the Graafian follicle. The theory advanced by Marchand, that ciliated cysts may originate from tubal epithelium, still remains to be proved. To summarize, therefore, it may be said that both pseudomucinous and serous cysts may have their origin in the germinal epithelium or in the Graafian follicle.

Metastasis and Malignancy.—Both varieties of proliferating cysts may give rise to metastasis. While cystadenomata or pseudomucinous cysts are usually classed with benign tumors, occasionally metastases have been observed, especially occurring in the peritoneum, which must be regarded as implantation metastases. They have most frequently been noted in cysts with papillary growths, and they tend to develop underneath the peritoneum in the form of cystic growths containing gelatinous masses, and have been termed pseudomyxoma peritonei (Werth). They most frequently follow spontaneous rupture of cysts, thus allowing the cyst contents to escape into the peritoneal cavity, though they have been observed to follow operation for the removal of cysts, when they must be regarded as implantations occurring at the time of operation.

Various theories have been advanced in explanation of implantation metastasis, but it is generally believed that it takes place at points where, from irritation, as from pressure or operative procedures, the endothelial lining of the peritoneum has been destroyed. These metastases are possessed of no special degree of malignancy, but are particularly prone to recur after removal.

Metastasis is much more frequently observed to follow serous cysts. The glandular form is benign and does not tend to recur after removal or to give rise to metastasis. The papillary form, however, is particularly characterized by the tendency to metastasis, which occurs, according to Pfannenstiel, in the proportion of about 13.3 per cent. Metastases almost invariably occur in the peritoneum, and appear as superficial cauliflower growths. They are very persistent, and only complete and thorough removal by radical operation will effect a cure.

Both varieties of ovarian cysts may undergo malignant degeneration. From the epithelial elements carcinoma may have its origin, while sarcoma may begin in the connective tissue of the wall of the cyst. A cyst can only be said to have undergone carcinomatous degeneration when the carcinoma is localized in small areas while the remainder of the tumor presents no evidence of malignancy. In case the carcinomatous process is widespread, the tumor must be classed as primarily carcinoma (see Carcinoma of the Ovary).

Sarcomatous degeneration of the walls of cystadenomata has been only rarely observed. Cases have been reported by Pfannenstiel, E. Frankel, and Kelly. Such degeneration may occur in the form of a nodule or as a diffuse infiltration of a considerable area of the cyst wall.

OVARIAN EMBRYOMATA

(*Dermoid Cysts and Teratomata*)

Dermoid cysts are so called because their contents are largely made up of epithelial structures associated with the *derma* or integument.

They are the least frequent of ovarian cysts, occurring, according to Olshausen, in the proportion of about 3.5 per cent.

They are usually small, seldom reaching a size larger than a man's head.

They are commonly unilateral, though bilateral tumors are by no means infrequent. Gebhardt, among 107 cases, found 16 bilateral. In most instances they present a smooth external surface, though they may be irregular in outline and be attached to the surrounding structures by adhesions.

Generally they are attached by a well-formed pedicle, and only rarely do they develop within the folds of the broad ligament.

In the majority of instances they appear as simple cysts, though close examination will frequently reveal the remnants of septa or small cysts within the tumor walls.

The cyst contents vary in consistence. In pure dermoid cysts they consist of an oily fatty substance, frequently resembling vernix caseosa, which thickens on cooling. It often contains loose hair, which is usually rolled in balls, besides caseous masses that are accumulations of sebaceous matter.

On section a typical dermoid cyst is unilocular. More frequently, however, dermoid cysts are combined with proliferating cysts, in which one or more of the cyst cavities contain dermoid structures. According to Pfannenstiel, they are most frequently combined with pseudomucinous cysts, and very rarely with serous papillary cysts.

The outer layer of the cyst wall is fibrous and usually thin, while the inner layer consists of a structure resembling skin, from which are frequently found growing appendages of the skin, as hair, teeth, occasionally nails; and in them are developed sweat and sebaceous glands.

Between this layer and the outer cyst wall is usually found a structure resembling adipose tissue, which consists largely of fat and connective tissue; in it are often found bone, smooth muscle, more rarely nervous tissue, cartilage, and, in a few instances, glandular structures resembling the mammary and thyroid glands have been observed. Very rarely structures corresponding to the intestinal or respiratory tract have been observed. In these structures Wilms has recognized an attempt at reproduction of the three embryonal layers, namely, those growing from the ectoderm, including skin and appendages; those from the mesoderm, consisting of fat, connective tissue, bone, muscle, and nervous tissue; and endodermal structures, resembling intestines and respiratory tract.

As a rule, according to Rothrock, dermoid structures are found only in a small area of the cyst wall, appearing as a nodular raised prominence, which is covered with hair and may contain teeth or bone (Fig. 347). The hair in dermoid cysts is, as a rule, short, though it may rarely reach a length of several feet. It is usually of a reddish-brown or blonde color, which is uniform throughout the cyst. Teeth are usually irregularly shaped, often rudimentary, and, as a rule, only a few are present, though as many as 300 have been reported. They are generally incisors or molars, and are set with their crowns pointing toward the axis of the body. Not infrequently they are set in bone, resembling rudimentary jaws. The bones found in dermoid cysts simulate those which lie in positions near hair-covered skin, as the maxillary bones, bones of the cranium, or pubic bones. Less frequently bones resembling long bones have been observed, such as ribs, phalanges of fingers or toes, and even joint-like formations with cartilaginous covering have been described. Rarely brain-like formations have been observed, and

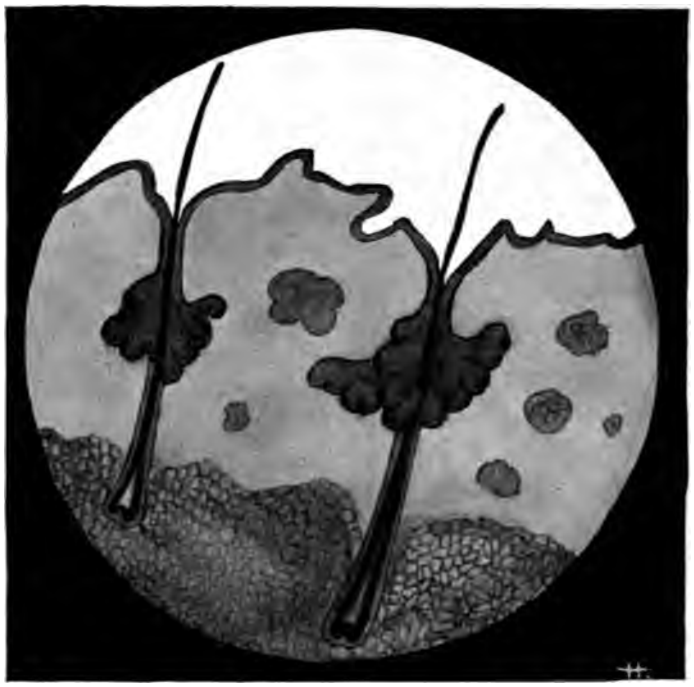


FIG. 347.—HAIR FOLLICLES, SWEAT GLANDS AND SEBACEOUS GLANDS FROM AN OVARIAN EMBRYOMA (DERMOID CYST). (After Gebhardt.)

eosin, and by this double stain the nuclei, cell contents, and periphery are clearly differentiated.

When stained they appear as high cylindrical cells with small basal nuclei, while the cell body consists of a clear transparent mass inclosed within the cell wall, which appears as a faint outline. Occasionally the cyst wall contains small duct-like tubes or glands, which originate in a proliferation and invagination of the cyst epithelium into the wall of the cyst. Frequently, instead of duct-like invaginations, their mouths will have become occluded from constriction of the connective tissue of the cyst wall, which is also in a state of proliferation, when they will appear as small cysts. The constant repetition of this process of epithelial proliferation throughout the tumor, together with the increasing contents from increased area of epithelial secreting surface, is responsible for its growth.

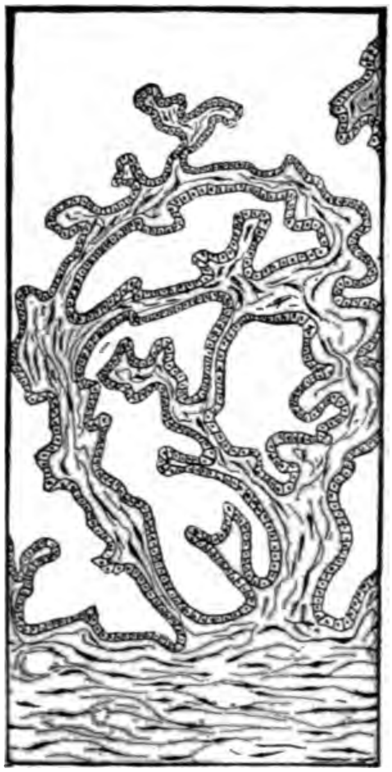


FIG. 346.—CYSTADENOMA OF THE OVARY. The papillary growths often present on microscopical section the most picturesque forms. (Whitacre.)

Papillary cysts, according to Pfannenstiel, develop in the following manner: First, a proliferation of epithelium takes place which causes tilting and displacement from crowding of the cells, carrying with them a thin underlying stratum of connective tissue; this, being rich in blood vessels, also takes on proliferation. In many instances the connective tissue proliferation appears to surpass the proliferation of the epithelium, which must, however, always be considered primary.

Serous (Proliferating) Cysts.—Serous cysts are much less common than the pseudomucinous variety, occurring in the proportion of about 1 to 8 of the latter. As a rule, they are small, and never reach the enormous dimensions of pseudomucinous cysts, although cysts the size of a pregnant uterus at term have been observed.

In external appearance they resemble somewhat pseudomucinous cysts. In contrast with pseudomucinous cysts, they frequently develop bilaterally. While they may lie free in the peritoneal cavity, attached by a well-formed pedicle, they frequently develop within the folds of the broad ligament, and show a special tendency to become attached to the neighboring viscera by adhesive bands.

On section these cysts are also multilocular, though, as a rule, they seldom contain so many cysts as the pseudomucinous variety. A certain proportion of serous cysts, especially the larger ones, may appear macroscopically as unilocular cysts, but microscopic examination will invariably reveal the presence of small cysts within the walls of the tumor. As a rule, these cysts contain papillary growths, and they represent the type of proliferating papillary cysts of the old classification, just as the glandular type is represented by the pseudomucinous variety. Occasionally, however, serous cysts may be of the glandular type and contain no papillary growths.

Papillary growths may be very abundant, and may completely fill smaller cyst cavities, and even cause rupture by pressure from increased contents, or they may grow through the wall of the cyst, causing perforation. Not infrequently serous cysts are encountered with papillary growths on their surface as well as in their interior. These may grow direct from the germinal epithelium, or may represent a continuation of intracystic papillary growths which have penetrated the wall of the cyst. Such cysts are almost invariably accompanied by ascites.

The contents of serous cysts consist of a thin, clear, straw-colored or greenish fluid, rich in albumin, but containing no pseudomucin. It is partly derived from cell secretion and partly from transudation from the blood vessels.

Histologically the wall of serous cysts, as of pseudomucinous cysts, is composed of three layers, differing only in the inner layer, which is lined by columnar ciliated cells. The papillary growths often present on microscopical section the most picturesque forms, usually consisting of rather scant connective-tissue stalks with branching processes extending in every direction from the main trunk. The epithelium covering the papillary growths is the same as that lining the cyst. Not infrequently deposits of lime salts are seen in the papillomatous growths, often presenting a concentric layer arrangement; they are termed psammomata.

HISTOGENESIS.—The origin of proliferating cysts of the ovary is still a matter of much controversy, although the investigations of many competent observers in recent years, summarized by Rothrock, have done much to throw light upon this obscure subject. Formerly all ovarian cysts were believed to originate in the Graafian follicle. Vir-

[illegible] the patient w[illegible] improve, an[illegible] diminished [illegible] pedicle ampu[illegible] adhesions.

[illegible] in the ovaria[illegible] the tumor, an[illegible] manifesting sign[illegible] of systemic toxemia [illegible]. The diagnosis is not difficul[illegible]. There is frequent extensiv[illegible] condition is by immediat[illegible] [illegible].

[illegible] with a twisted pedicle are, first [illegible] distention of the sac. Serous exudation from [illegible] following in the direction of least resistance, takes place, as a rule, into the cyst cavity rather than upon its surface. A certain amount of transudation is, however, observable on the surface, a condition which favors the speedy development of adhesions. The blood pressure becomes so great that hemorrhages frequently occur, as a rule into the cavity of the cyst, but occasionally upon the surface. It is rare that the cystic fluid in these cases is not discolored by blood elements. The blood pressure may become so great as to [illegible].

Ascites. Ascites is sometimes caused by an ovarian tumor, with [illegible] coexist as a complication. It is to be remembered [illegible] many cases the intraperitoneal accumulation of fluid may be the result of cardiac, renal, or hepatic disease. Care should be exercised to ascertain as nearly as possible the exact condition of these organs, and their possible causal relation to the ascites. If any of them present diseased conditions they should be subjected to appropriate treatment. It is true that this treatment may sometimes need to begin with ovariotomy, for renal, hepatic, and intestinal complications may be caused in the first instance either by direct pressure from a large ovarian tumor or by the mechanical interference of that tumor with the portal circulation. As a rule, however, such conditions may be found amenable to treatment before ovariotomy is performed, and when this can be accomplished it should be done. Douglas says that a small tumor with ascites appearing early is strongly presumptive of malignancy. If the ascites is from obstructed circulation the liquid will be a limpid fluid resembling water, perhaps slightly colored, containing a little albumin but no fibrin, and giving no sediment. If the ascites is from peritoneal inflammation the liquid will be thinner, but never transparent, always cloudy, looking like buttermilk, and smelling like decayed cheese. If the effusion is from simple serous irritation the liquid will be albuminous, rather clear, though sometimes colored like bile. In the sediment will be found elements of great importance. Large irregular cells may be seen, having a central nucleus surrounded by a quantity of granulations. The presence of these cells is usually taken as a sign of malignant growth.

Albuminuria.—Albuminuria is of frequent occurrence in connection with the larger cysts of the ovary. When the growth attains such a size that it exerts pressure upon the kidneys albumin is almost sure to appear in the urine, the condition being practically analogous to that which is frequently found in pregnancy. If the disease has been of long standing the changes thereby induced in the kidney may have reached the destructive degree. It is highly important, as a matter of routine, that the urine be investigated in all these cases before operation. The facts thereby elicited will have an important bearing upon the selection of an anesthetic and upon the prognosis of the case.

Adhesions.—Adhesions are liable to occur as the result of mechanical hyperemia, traumatism, or infection of the tumor. Adhesions may be single or multiple, firm or friable, local or general, and may bind the tumor to either the visceral or the parietal peritoneum. Adhesions between the tumor and the intestines, the abdominal wall, or the omentum are naturally the more frequent. While it is true that peritonitis ordinarily results in the formation of adhesions, yet Douglas and others have reported cases in which such a result did not follow distinct inflammatory attacks. Persistent, definitely localized pain, of the traction variety, at some point of the surface of the tumor is suggestive of adhesion, but the condition can not be said to present definite symptomatology.

Rupture of the Tumor.—Rupture of the tumor, when cystic, ma be induced by overdistention, papillomatous degeneration, infection, o violence. It frequently happens that in cysts of the pseudomucinou variety the secondary peripheral growths have very thin walls, an are consequently more liable to rupture from any of the precedin causes. The larger sacs, however, have been known to empty thei entire contents into the peritoneal cavity. This is an accident whic may or may not produce profound symptoms. If the rupture is slight, the sac small, and the fluid bland the accident may be almost symptomless; whereas if the rupture is extensive, the sac voluminous, and the fluid irritating or septic the symptoms may be those of profound shock, followed by acute peritonitis and septicemia. There is no means of determining in advance of exploration the exact character of the fluid of any ovarian tumor. Pure pseudomucin is not irritating, nor is it septic, but if the tumor has become the seat of infection, however slight, this material serves as a convenient culture medium, and may thus become the source of contamination. When there are grounds for suspecting rupture of the sac the indication is for immediate operation by abdominal section.

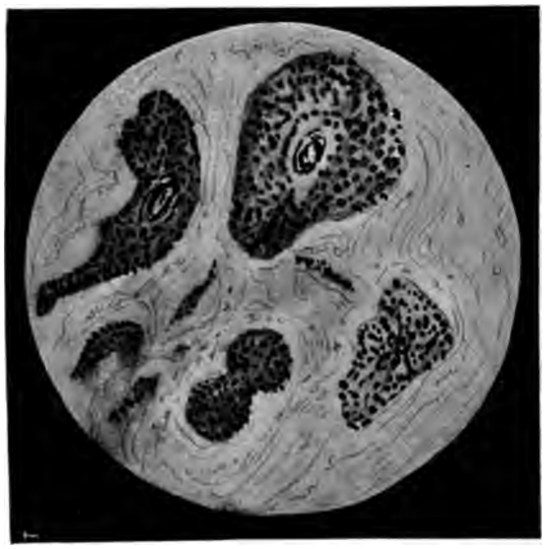


FIG. 348.—DERMOID CYST UNDERGOING CARCINOMATOUS DEGENERATION.

Malignant Degeneration.—Dermoid cysts may undergo sarcomatous or carcinomatous degeneration (Fig. 348). Sarcoma usually develops in the wall of the cyst.

Well-authenticated carcinoma beginning in dermoids has been observed in a few instances. It was formerly believed that it was always epidermal in character. Recently, however, Yamigiva found a glandular carcinoma which he believed to have originated in a pseudomammary gland.

SYMPTOMS AND DIAGNOSIS OF CYSTADENOMATA AND EMBRYOMATA OF THE OVARY

Before Lawson Tait established the legitimacy of exploratory incision as a diagnostic measure the study of symptoms in cases of abdominal and pelvic growths, especially of cystadenomata, was carried to great refinement—some of it very absurd. Efforts were made to tell not only whether a tumor was solid or cystic, but to determine relatively how much of solid or fluid element was present. If obviously a cyst there was serious guessing to determine whether it was unilocular or multilocular, and rules were solemnly drawn up and promulgated for the solution of this grave question. Then, too, adhesions and the amount of pressure in one direction as opposed to pressure in another direction were gravely guessed at and duly recorded. Patients with large tumors were thumped and pummeled and made to assume diverse and sundry postures, were stethoscoped, even aspirated, at the hazard of their lives, all to lead up to facts that were perfectly obvious from the start, viz., that the patient had a tumor, that the tumor was a hazard to her life, that only one thing was to be done, and that was to remove the growth. And when the removal, made more difficult by this diagnostic monkeyosity, was attempted about seven-tenths of the guesses, all but the fact that the tumor existed, were found to be wrong.

Tait, in his masterful way, swept all this diagnostic flummery aside. I have seen him diagnosticate an ovarian tumor in two minutes and decline to go into an additional detail. There was nothing to be done, in any event, but to attempt the removal, and the only way to determine the practicability of that step was to open the abdomen, first to explore the conditions, and next to remove the growth then and there, if the exploration showed such a course to be feasible. If found to be impracticable the patient had at least had the question settled scientifically, rationally, and without hazard to herself.

This principle of exploratory incision, now universally accepted, while the most valuable of our diagnostic resources in surgical practice, has, however, unfortunately led to a too general disregard of the phenomena induced by visceral diseases.

In their early stages ovarian cystomata are ordinarily so symptomless that their very existence is not even suspected. This is especially true of the cystadenomata. In many cases there are no symptoms whatever to attract attention to the pelvis, until the patient by accident discovers that she has an enlargement in either one or the other lower quadrant of the abdomen.

In certain forms of ovarian growth, notably in dermoids, there is pain from a very early period. In a majority of cases, however, there is nothing more than a vague sense of discomfort in the pelvis, due to the weight and tension exercised by the developing tumor.

There may or may not be a disturbance of the menstruation, and, even in ovarian tumors of large development, the menstrual function seems to be but slightly modified. This modification of function may tend in the direction of either increase or diminution of the flow. In those cases in which the flow has increased there will generally be found an antecedent history of pelvic disturbance—probably of an endometritis. In cases of amenorrhea due to developing ovarian cystoma the disappearance of menstruation, coincidentally with abdominal distention, may lead to a suspicion of pregnancy. Cases of this kind are of frequent occurrence.

While the tumor is yet relatively small it occupies a position within the true pelvis, but, as it grows larger, it ascends into the abdominal cavity, just as does a pregnant uterus. When the tumor is yet within the pelvis its weight generally causes it to fall into the cul-de-sac of Douglas, usually either to one side or the other of the uterus. At this stage of its development bimanual examination will enable the surgeon to outline the growth, and perhaps to determine from which side it develops. It is generally felt as a hard or semi-fluctuating globular mass, its spherical outline being readily detected by palpation through the abdominal wall. To determine the side from which it develops and the location of its pedicle Hegar advises drawing down the uterus with a tenaculum, employing the rectal touch or bimanual manipulation to outline the attachment. The mobility of the tumor depends upon the length and size of its pedicle, which is sometimes long enough to permit the growth to be carried far up to the pelvic brim, while in other cases it is so short that the tumor feels more like an abscess than a neoplasm.

In some cases the tumors are bilateral, a circumstance which may readily be confused with a multilocular or a multinodular growth. The uterus is very liable to be displaced to either one side or the other; or, as occasionally happens, the growth may be poised above and behind the womb, forcing the latter forward into a state of extreme anteversion. As the tumor grows larger, however, and descends into the abdominal cavity, its spherical outline becomes more and more apparent by abdominal palpation. Irregular bosses or protuberances upon the surface of the growth indicate that it is multilocular.

On percussion the tumor will yield dulness over its entire area. One of the essential diagnostic signs relied upon by Dunlap, who was one of the very earliest of the world's ovariotomists, was the position of the intestines. As the tumor develops from one side or the other of the pelvis, the bowels are pushed upward and toward the opposite side. Abdominal resonance is restricted to the area occupied by the intestines. This position should be more or less constant. If a patient with fluctuating distention of the abdomen yields an area of dulness in the lower two quadrants of the abdomen, with a resonant note above, and if she manifests these signs both when sitting and lying, it may be safely assumed that she is either pregnant or is the victim of an ovarian tumor. If, however, upon lying down the area of resonance descends toward the pubes, a suspicion of ascites rather than of either of the foregoing is justifiable.

As the cyst increases in size and weight it exercises increasing pressure upon the neighboring viscera; this is the frequent cause of vesical irritation, constipation, and occasional profound disturbance of the kidneys. The urine under such circumstances becomes scanty, is loaded with albumin, and, if the pressure is long sustained, edema of the extremity is the result. Hemorrhoids are another annoying result of pressure. Areas of pelvic tenderness are sometimes complained of when the tumor has attained considerable size. These are generally the results of either pressure or slight traumatisms, and depend upon the fact that the tumor, after attaining considerable size, may lose areas of protective epithelium and form adhesions to either the visceral or the parietal peritoneum.

It may be accepted as a rule that the more rapid the growth the more liable is it to be of a malignant character. The solid tumors are of the slowest growth, while proliferating cysts grow with more rapidity than any other of the benign neoplasms. When a growth which has been increasing at a certain rate manifests sudden acceleration in development it should become an object of suspicion; the sudden increase may depend upon a change of type from benign to malignant, or it may mean that the efferent circulation of the tumor has been interfered with, either by pressure of the growth itslf, by torsion of the pedicle, or by other causes. The increase in the volume of a tumor due to sudden twisting of the pedicle is very sudden, and is associated with pain, followed in the course of a few days by toxemic symptoms due to the absorption of necrotic products from the tumor itself. Increase of size due to a twisted pedicle may become spontaneously arrested, the tumor itself surviving by virtue of nutrition derived from extensive peripheral adhesions.

The diagnosis of small ovarian tumors is relatively difficult. Pain, while usually present, does not bear any constant relation in its location to either the situation or the variety of the tumor. Menstrual disturbances are the rule, the variation tending in the direction of excessive rather than of diminished flow. There seems to be a direct causal connection between severe uterine hemorrhages and cystic ovaries when the latter are closely adherent to the uterus. Uterine hemorrhage associated with a pelvic tumor which is uninfluenced by intrauterine treatment is more likely to be due to an ovarian tumor than to a fibroid. Reflex symptoms are comparatively rare, and occur chiefly in the later stages of the disease.

Pregnancy has been mistaken by a number of the most distinguished operators for an ovarian cyst. It may be stated that there are but few distinguished operators in the world who have not at one time or another made an exploratory incision with the result of finding a pregnant uterus instead of the suspected cyst (see Pregnancy as a Complication of Ovarian Tumors). In extenuation of this accident it should be remembered that an ovarian tumor may occupy such a position as to interfere with the detection of pregnancy by either vaginal or bimanual manipulation, and it must be remembered, furthermore, that among the occasional erratic symptoms of ovarian cystoma are reflex vomiting and mammary development, with enlargement, softening, and blue coloration of the cervix. In view of these facts occasional mistakes are to be expected. In the great majority of instances of pregnancy, however, the placental bruit may be heard, while later ballottement may be practiced; and, after the period of quickening, the fetal heart may generally be detected. It must be remembered, however, that even these signs may be obscured. This is particularly true of the placental bruit, which may be completely masked by the more pronounced bruit of the almost cavernous veins that develop in certain of these tumors. Ballottement may be defeated by the ascent of the uterus and the relatively low position of the tumor; while the fetal heart may be situated so remotely that its pulsations can not be heard.

Ascites is not infrequently mistaken for a unilocular ovarian cyst. This is particularly true in cases of encysted ascites, where the induced area of dulness remains inconstant, even when the patient assumes different positions. The ascites of tuberculous peritonitis frequently occurs in connection with tuberculous involvement of the mesenteries, or at least of the mesoenteron. The result of tuberculous infection in this locality is a contraction of the peritoneal fold, which prevents the intestines, even when laden with gas, from floating upon the surface of the ascitic fluid. In these cases, however, the morphology of the growth may be taken as a reasonably safe index of its character. A tumor fluctuating and spherical in the upright posture will maintain its outlines with but trifling variation when the patient lies down, whereas, if the distention depends upon free fluid in the peritoneal cavity, the abdomen will flatten to a certain degree, while there will be a corresponding distention of the iliocostal interval. It rarely happens that a tumor so develops as to distend the abdominal wall between the crest of the ilium and the ribs.

Large cysts of the mesentery and hydronephrosis have been mistaken for ovarian cysts. To distinguish between an ovarian cyst and hydronephrosis it is important to remember that in the former the tumor develops from below upward, and in the latter from above downward. In the former the upper and in the latter the lower margin of the growth is free. This sign is, of course, absent when the cyst is large enough to fill the abdominal cavity. If the tumor is of congenital origin the presumption of hydronephrosis is strengthened, although Alban Doran has reported a case of congenital ovarian tumor. The position of the colon relative to the cysts is important in distinguishing between these two conditions. In many cases the bowel can not be palpated or percussed, under which circumstances Simon introduced an effervescing enema to distend the bowel. Exploratory puncture has been practiced as a diagnostic means in cases of suspected hydronephrosis, but it is not to be recommended, not only for the reasons already enumerated, but because, according to Pozzi, the fluid from hydronephrosis is no more characteristic than is that from the proliferating serous cyst of the ovary or of the parovarium. Urea and uric acid may be absent from hydronephrosis and present in an ovarian cyst, a circumstance which will only tend to increase the preëxisting confusion. Urethral catheterization, as practiced by Pawlick and Kelly or Nitze, may be of value in distinguishing between these two frequently confusing conditions.

Ecchinococcus cysts of the peritoneal cavity may be mistaken for ovarian tumors. They acquire great volume and give rise to corresponding distention of the abdominal walls. They may displace viscera, encroach upon the diaphragm, and occasion interference with the action of the heart and lungs, just as occurs in cases of advanced or neglected ovarian tumors. The facts, however, that the growth started in one of the upper quadrants of the abdomen, generally the right, extending thence toward the pelvis, and that the growth is more rapid than is ordinarily the case in pelvic tumors, will place the practitioner upon his guard. The fluctuation in hydatids is remote and circumscribed. The hydatid fremitus is considered characteristic and decisive. It is presumed that, in the majority of these cases, the origin of the parasitic infection is in the liver, and that the contamination of the peritoneum is consecutive to rupture of a lymphatic cyst and the consequent escape of the echinococci into the peritoneal cavity. When once implanted in the peritoneum, however, these parasites may go on multiplying in any one cavity. They may undergo retrogressive changes, and may themselves become the seat of bacterial infection. Sir Spencer Wells has recorded a case in which the degeneration of the hydatid cysts was associated with the formation of gas, due in all probability to the action of the *Bacillus aerogenes capsulatus.*

Large malignant neoplasms of the lymphatics may occasion confusion in making a diagnosis of a seeming ovarian tumor. These growths may originate from the lymphatic glands within the broad ligament, or beneath the pelvic peritoneum, or even higher up. Dr. Mary Almira Smith, of Boston, has reported an interesting case in which a large malignant growth had developed from a lumbar lymphatic gland. It was the size of a child's head and presented all the physical characteristics of an ovarian tumor.

Phantom tumor yields a resonant note on percussion and entirely disappears under anesthesia.

A *distended bladder* has been mistaken by very capable physicians for an ovarian cyst. When the fluctuating tumor occupies a median position and extends to the symphysis pubis, and when it can not be moved from this position, a catheter should always be inserted as a precautionary measure. The indication for catheterization is positive when the patient complains of slight incontinence.

Fibrocystoma of the uterus may present many physical signs in common with an ovarian tumor. Rishmiller in this connection calls attention to the fact that fibrocystoma of the uterus is relatively infrequent, and occurs usually in women over thirty years of age. Its growth is slow at first, but rapid after attaining a certain size. Menorrhagia is seldom present. In fibrocystoma we have a lobulated condition which can be felt through the abdominal parietes, umbilicus not prominent, uterus moving with the tumor, and the uterine cavity generally elongated; while in ovarian cyst we have no lobulation except in polycysts, the umbilicus is prominent, the uterus moves independently of the tumor, and its cavity is not elongated. The detection of hard nodules would be significant, but hard and tense cysts may impart the same sensation. Fluctuation is very hard to detect, for the reason that the tumor gives rather an elastic feel.

These confusing conditions, occurring with relative frequency in the hands of the most distinguished and experienced operators, became so apparent to Lawson Tait that he proclaimed not only the expediency but the importance of *exploratory incision* as a diagnostitial measure. This decree has been ratified by the universal acquiescence of the medical profession. The presence of an abdominal tumor of undetermined character and showing a constant tendency to increase in size is of itself not only a justification, but an imperative indication, for an exploratory abdominal section. The time has long since passed when surgeons felt justified in pronouncing an unequivocal diagnosis of the exact character of intraabdominal growth upon evidence furnished by external examination alone.

Puncture of the cyst through the abdominal wall or through the vagina is never a justifiable diagnostitial measure. The fact that puncture is sometimes practiced without incident does not in the least demonstrate that the operation is without danger, or that the operator is without responsibility.

TREATMENT OF CYSTADENOMATA AND EMBRYOMATA OF THE OVARY

All attempts to cure these growths or to arrest their progress and development by medicines, manipulations, or electricity have proved not only futile, but in many instances directly damaging to the patient. It should be accepted as a rule that all cases of ovarian tumors should be operated upon as soon after the diagnosis has been made as the conditions will judiciously permit. Delay may be indulged in temporarily to improve the general condition of the patient and to place her in a better condition for operation. But it should never be prolonged beyond the time necessary to put her in the best condition for ovariotomy.

Ovariotomy.—This is the name which, by convention, has been accepted all over the world to designate the operation for the removal of the larger growths of the ovary. Ovariectomy would probably be a more appropriate name, but, as there is no more substantial reason than etymologic accuracy for the change, the universal usage may well remain undisturbed.

Ovariotomy marked the beginning of all that now stands for surgery within the abdomen and pelvis. It was first performed by Dr. Ephraim McDowell, who lived in the town of Danville, in what was then known as the backwoods of Kentucky. He had been a student in Edinburgh of John Bell, who had suggested in his lectures both the possibility and the advisability of removing ovarian tumors, though he himself had never operated for this purpose.

The seed sown in the mind of young McDowell brought forth its first fruit in 1809, when he removed a large ovarian tumor from Mrs. Marion Crawford, who not only recovered from the operation, but lived thirty-eight years afterward. Although McDowell did not publish the report of this case and of two other similar operations until 1816, his claim to be the first ovariotomist in the world is now everywhere admitted without dispute. McDowell performed altogether 13 ovariotomies, with 6 deaths.

The principal operators in America to follow in the footsteps of McDowell within the next twenty-five years were Dunlap, of Ohio; Nathan Smith, of Connecticut; Peaslee, of New York, and the Atlees, of Pennsylvania. Lizars operated in Edinburgh in 1824 and 1825, but with such poor success that the operation did not gain much headway in Great Britain until 1842, when Charles Clay, of Manchester, scored a success greater than any operator up to that date. Baker Brown, between 1852 and 1856, performed 9 ovariotomies with 7 deaths. He operated no more for four years, when he began a most successful career, which was suddenly cut off by his untimely death. In 1858 Spencer Wells, of London, commenced his remarkable record, which, at the time of his death, had gone well up toward 2,000 cases. He reduced the mortality of this operation to 25 per cent., but never got much below that figure. In 1862 Thomas Keith, of Edinburgh, performed his first operation, and soon became the most successful living ovariotomist. Lawson Tait, of Birmingham, in the course of his extraordinary and startling career, reported a series of 139 ovariotomies without a death. Bantock and Thornton, of London, following in the footsteps of Spencer Wells, in the Samaritan Free Hospital of that city, greatly improved upon the teachings of their master, and reported long series of ovariotomies with much smaller mortality than Wells had ever been able to secure. In France the operation did not make equally rapid headway until Péan and his followers began to do very successful work. On the Continent Koeberlé, Schröder, Billroth, Martin, Leopold, Sänger, and many others began and carried on the good work, until now, in all parts of the world, ovariotomy is one of the most successful of modern surgical operations. Thousands of women have had their lives saved, and have lived long years of usefulness and happiness as a final result of McDowell's glorious effort in 1809.

Ovarian tumors should be removed as soon as preparation can be conveniently made after their diagnosis. There is no wisdom whatever in delay for any other purpose than to put the bodily functions of the patient in the best order; and even this can generally be done more effectively by removing the offending tumor. Nothing can be gained and everything may be lost by merely putting off the operation. No medicine or outward application or treatment of any kind whatsoever is likely to cure an ovarian tumor. As ovariotomy is the only source of relief, the sooner it is resorted to the better. The life of a woman with an ovarian tumor, as a rule, is not greater than three years from the time of its discovery. She is likely never to be in a better condition for the operation than at the time of diagnosis. The chief indication, then, for ovariotomy is a clear and unmistakable diagnosis of tumor.

When pregnancy occurs in connection with ovarian tumor the question of operation or no operation is often a matter of serious dispute. It is to be remembered in this connection that the mortality from this operation, if done during the first five or six months of pregnancy, is not higher than when done in a non-pregnant state. Olshausen has performed the operation 26 times without a single death. The danger to both mother and child increases with the progress of gestation. The results are most favorable for the mother in the second, third, and fourth months, and for the child in the third and fourth months, although favorable results are obtained even in the last month of gestation. The liability to rupture renders ovariotomy the desirable alternative at any stage of pregnancy.

"Palliative" treatment by puncture of the cyst does not palliate; on the contrary, the cyst rapidly refills, with an increased tendency to adhesion and rupture.

Successful cases of double ovariotomy during pregnancy have been reported by VanderVeer, Knowsley Thornton, Gardner, Montgomery, Mundé, Potter, Bovee, and others. Potter's case went to full term after a double ovariotomy done during the course of gestation. In this case Potter operated in the latter part of the fourth month; there was a tendency to rhythmic uterine contractions on the seventh day, but these speedily subsided, after which the patient went to full term without incident.

The patient should be prepared for the operation in accordance with the rules laid down in the division on Principles and Management of Operations.

The instruments most frequently required are: one or two sharp scalpels; a dozen hemostatic forceps; half a dozen prepared sponges or gauze pads; three pairs of scissors, one long and straight, one curved on the flat and blunt pointed, and one short, thick, strong, and curved at right angles; two dissecting forceps for picking up the peritoneum; Tait's or Spencer Wells' trocar with long rubber tubing attached, to conduct the fluid into a bucket under the table; two large cyst forceps, to grasp and withdraw the empty sac; two long aneurysm needles, threaded at the point, for transfixing and ligating the pedicle; a good free-working irrigation apparatus; needles, long, straight, and curved, to close the abdominal incision: an assortment of sterilized silk, silkworm gut, and catgut; long perforated glass tubes, and sterilized gauze, to be used, if necessary, in drainage.

The following also *may* be needed: an assortment of large and small pressure forceps, a catheter, retractors, rubber cord or tubing, fine curved and straight needles, a portable electric light, an electrocautery, and Monsel's solution. All these instruments, sutures, etc., should be carefully assorted and placed in appropriate trays upon a table near by and covered with sterilized hot water by the assistant, who is to hand them to the operator as needed during the various stages of the operation. A basin of hot water should be placed upon a small table near the surgeon, in which he can immediately cleanse his hands should they become soiled. This water will need to be frequently changed as the operation proceeds.

While these and all other preparations by the surgeon and his assistants and nurses are going on to insure an aseptic environment and operation, the patient, who has also been properly prepared, may be anesthetized in an adjoining room, thus preventing the fright and shock of being brought into the operating room and placed upon the table in plain sight of the instruments, the operator, and his assistants in their operating costumes.

165. PROCEDURE OF OVARIOTOMY (AFTER TABER JOHNSON)

(1) The abdominal incision is made in the median line. It need not be longer than 3 inches at first, and should be carefully and deliberately made. Reckless opening of the abdominal cavity with one stroke of the knife is as unwise as it is dangerous. Should occasion require, the opening can be easily enlarged with the scissors, when necessary, to deal with adhesions or to deliver partly solid tumors without bruising the tissues. While advocating the short incision, one as long as is necessary is always made as we proceed. It is not needful to spend valuable time in searching for the linea alba. Many surgeons think that a stronger cicatrix is secured by the union of the cut muscles.

(2) Before opening the peritoneum all bleeding should be arrested.

(3) That membrane may now be caught up between two forceps and nicked with a knife or scissors. In order to avoid the possibility of injuring the intestines, it is safer to roll the peritoneum between the thumb and finger before opening it. The intestines, if not adherent, will immediately drop back out of harm's way as soon as air rushes in through the opening.

(4) The incision is now enlarged with the scissors upon the index finger, which acts at the same time as a guide and a protection to the intestines against injury. All bleeding having been arrested, two fingers of the left hand, or the hand itself, should be passed over the face of the tumor in all directions to ascertain the nature and extent of adhesions (Fig. 349).

The pearly-gray cyst wall can be readily seen through the gaping edges of the wound, and a large-size Tait trocar (Fig. 350) can be passed into the tumor at the upper angle of the wound, and the fluid drawn off through a tube at the end of the trocar, which conducts it into a sanitary bucket underneath the table (Fig. 351).

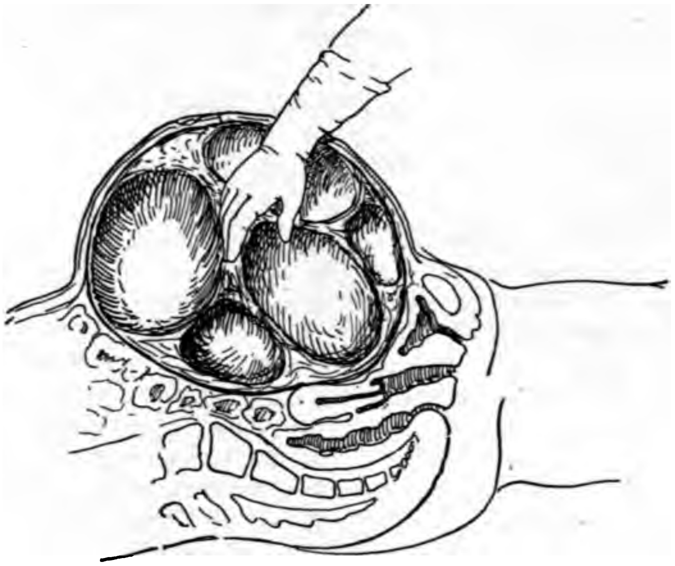


FIG. 349.—(165) PROCEDURE FOR OVARIOTOMY. (a) The whole hand and forearm are sometimes introduced to explore the relations, break down adhesions surrounding and septa within the tumor.

(5) The collapsing walls of the emptying cyst, unless prevented by adhesions, may now be drawn out of the wound with the fingers or with large cyst forceps. The assistant should press together the abdominal walls, which will aid in the expulsion of the cyst contents and at the same time prevent the escape of intestines, the soiling of the edges of the abdominal wound by the fluid contents of the cyst, or their entering the abdominal cavity. If it should be a multilocular cyst

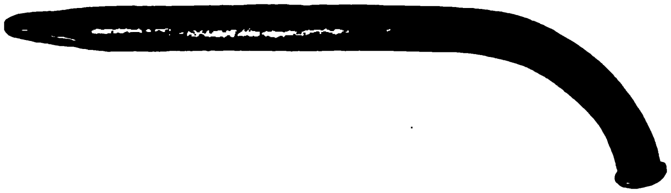


FIG. 350.—THE TAIT CURVED TROCAR.

its various compartments may be emptied by passing the trocar in different directions (Fig. 351). If this does not succeed in reducing the size of the tumor sufficiently, the hand may be passed into an enlarged opening, and these various compartments ruptured with the fingers. The hand, upon withdrawal, may bring the collapsed tumor sac along with it. It is wise to keep the opening in the cyst wall always clamped and outside the abdominal cavity, in order to prevent the soiling and infection of the peritoneum by any colloid, dermoid, or other infecting material, which it would be exceedingly difficult to wash out (Fig. 352).

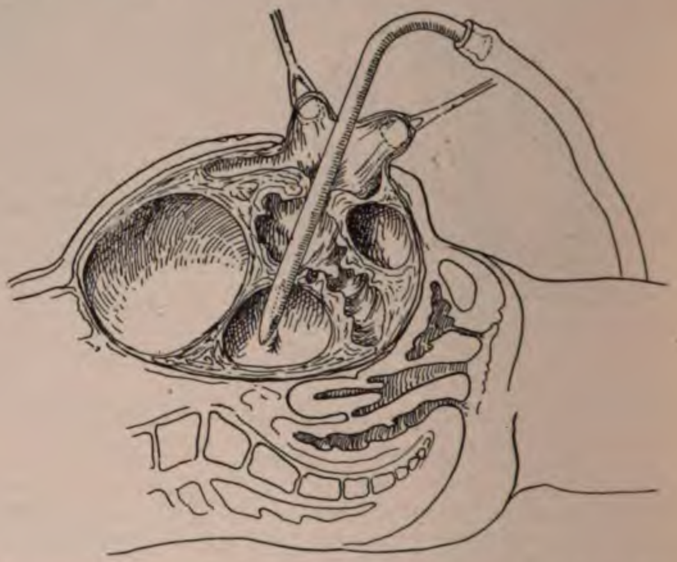


FIG. 351.—(165) PROCEDURE FOR OVARIOTOMY. (b) The large Tait trocar with hose attached has been introduced through the wall of the presenting cyst, and has been passed thence through two partition walls, and the collapsing tumor is being drawn out with forceps.

(6) Any adhesions which may exist will come into view as the empty sac is withdrawn. Those which are recent and the result of inflammation can be easily pressed off with gauze, or separated with the fingers. Older and firmer adhesions, which are likely to contain blood vessels, should be ligated in two places with fine silk or catgut, and cut between the ligatures with the scissors.

Adhesions of the omentum are generally vascular, and bleeding surfaces which are not controlled by exposure to the air or sponge pressure may require ligation. When the cyst wall is adherent to the intestine, or can not be readily peeled off, a portion of it may be left attached rather than to run the risk of laceration by its forced separation.

(7) Should an opening be made in the intestine it should be immediately closed with fine silk.

(8) While an assistant holds up the empty sac or delivered tumor the operator transfixes the pedicle as near as possible to the uterus with a long-handled, dull-pointed needle, threaded at the point with pure Chinese silk or catgut; according to his preference, and thus securely constricts the vessels and tissues in the pedicle. When doubt exists as to perfectly safe constriction the ligature is brought around the entire mass and securely tied again, thus shutting off any possibility of subsequent hemorrhage (Fig. 353). A figure-of-eight or a Staffordshire knot, when properly applied, is equally safe. If we meet with a pedicle especially broad and thick it may require ligation in several places, making what is called a chain ligature.

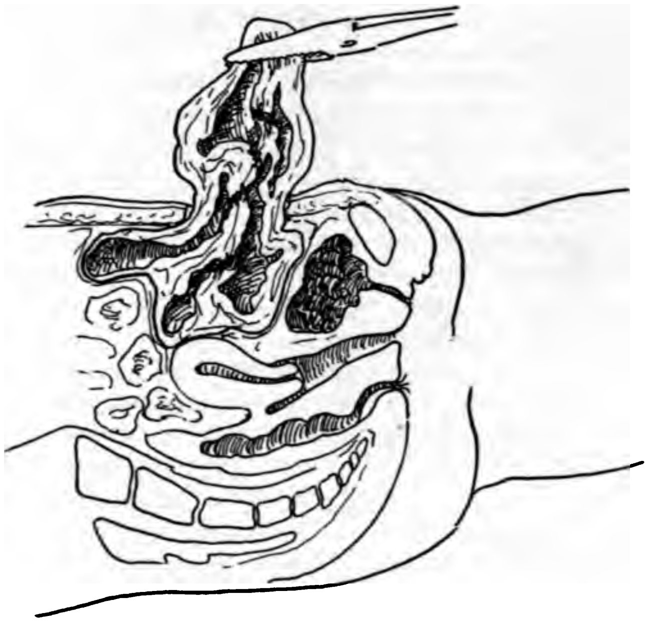


FIG. 352.—(165) PROCEDURE FOR OVARIOTOMY. (c) The traction clamps have been removed and a long closure clamp has been fastened to control the opening in the cyst. The cyst, partially emptied, is being withdrawn through the relatively small incision.

(9) In cutting off a tumor above the point of constriction a button of tissue should be left, sufficiently large to prevent the possibility of the slipping off of whatever ligature is used.

Morris, of New York, has described a variety of tumor of the broad ligament which has no pedicle whatever, and has taught us how to enucleate it with safety from the tissue in which it lies imbedded, ligating separately any bleeding vessels which are discovered.

After the removal of an ovarian tumor the other ovary should be examined also; if found healthy it should be let alone.

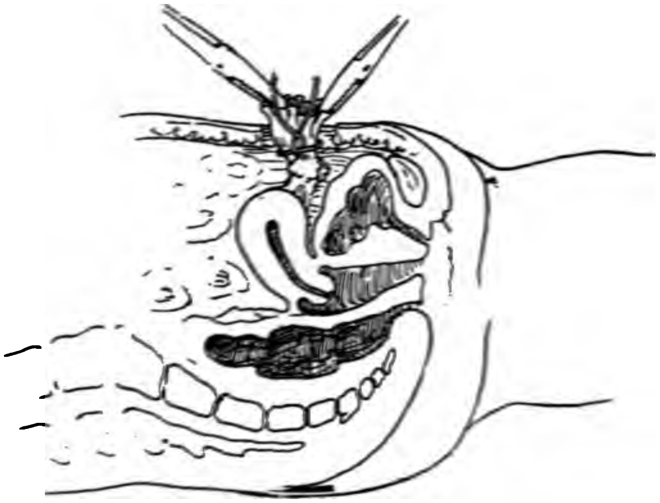


FIG. [illegible].—(d) PROCEDURE FOR OVARIOTOMY. (d) The pedicle has been cut long enough to leave a safety button at the end. A Staffordshire ligature has been adjusted ready to be tied.

I. In those cases in which a simple ovarian tumor has been removed without rupturing or spilling its contents into the abdominal cavity, very little in the way of a toilet is required; the less manipulation of the intestines and exposure of the abdominal contents the better. A [illegible] held in the grasp of a long-handled forceps, which is usually passed down into the pelvic cavity in search of blood [illegible] this may frequently be omitted, and the omentum carefully drawn down over the intestines and the wound closed.

II. In those cases where the omentum has been lacerated or torn in separating it from the tumor, or if there is any evidence of bleeding, it should be carefully drawn out of the wound, spread out on hot sterilized towels, and the bleeding points caught and ligated. In most cases simple oozing can be arrested by hot water or by sponge pressure. If some portion of the omentum [illegible] lacerated a ligature may be applied behind the [illegible] omentum tissue boldly cut away. In those cases where there has been much hemorrhage from tissues lacerated by the separation of adhesions, or the abdominal cavity has been soiled and possibly infected by fluids from malignant tumors, or by pus from infected abscesses, the cavity should be thoroughly irrigated with hot normal salt solution.

(12) The abdominal wound may be closed by what have been described as through-and-through sutures, or the tissues may be brought together by continuous sutures, according to the preference of the operator.

(13) In those cases where drainage is considered absolutely necessary on account of the soiling of the peritoneum with infectious fluid, gauze drainage is used much more frequently than the glass tubes. Neither the glass tube nor gauze drainage is likely to be of much service after twenty-four hours, for the glass tube does not drain any greater area than the little pocket at its distal extremity, on account of its being shut off from the abdominal cavity by lymph which has been poured out around it; while gauze, after it has once become wet, ceases to absorb more fluid, and only drains by lying in contact with dry gauze which may absorb from it.

(14) The wound should be thoroughly dried and cleansed, and pads of gauze placed on each side of the row of sutures, and another thicker gauze pad laid over them both. This dressing is then secured by broad strips of porous adhesive plaster. A thin flannel or many-tailed bandage may now be applied, securely holding the dressings permanently in position. These do not require to be changed for seven days if all goes well. If the tumor has been very large, and the abdominal walls have sunk in considerably, the depressed spaces should be filled out by sterilized absorbent cotton.

The After-treatment of Ovariotomy.—The after-treatment of a simple case of ovariotomy amounts to little more than keeping the patient clean and letting her alone. Give her a cheerful nurse, protect her from visitors, and encourage her to get well. Little medicine is required beyond what is necessary to move the bowels, quiet restlessness, and produce sleep. As soon as the patient has had a good operation from the bowels she is considered convalescent. This is usually produced by small doses of calomel, followed by teaspoonful doses of Rochelle salts, every two hours until the bowels move. It was formerly the custom to withhold all food or drink for twenty-four hours. The piteous appeals of the patient for water to quench her thirst were stubbornly resisted, but we find by increasing experience that patients may, without injury and greatly to their comfort and happiness, take frequent sips of hot water or tea a few hours after their recovery from the anesthetic, unless tormented by the ether nausea. Patients, it is found, may also take with benefit small drafts of beef essences or concentrated forms of liquid nourishment after the first twelve hours. If this disagrees with them it should be withheld for a while. It is best to adhere to the rule that patients should not see visitors for a week after their operation. Exceptions will occur where a discreet mother or husband may see the patient a few days after her operation with great benefit. The patient should be urged to pass her water in a bedpan. The use of the catheter in the hands of the most skillful nurse has often produced urethral or vesical irritation. Its routine use for several days after all ovariotomies should be abandoned.

The use of opium should be avoided when possible, as the patient's pain, nervousness, and restlessness are generally increased and prolonged by the unwise use of this drug. There will occur now and then a case where a hypodermic of morphin or codein will quiet restlessness and produce the greatest amount of comfort, with no harm whatever following its use; but the routine employment of opiates after ovariotomy is full of mischief and trouble.

If the bowels are painfully distended by collections of gas the introduction of a rectal tube gives much relief.

If upon removal of the dressing on the seventh day the wound is found well united the sutures may be all gently removed. If union is not perfect, or if stitch-hole abscesses have occurred, a few of the stitches can be left for two or three days longer. If the wound is perfectly dry no treatment is necessary, but narrow strips of rubber plaster may be placed across the wound to hold it securely while a firmer union is taking place. The gauze dressings should be changed and held in position by a firm clean binder.

It is better for the patient to remain in bed three weeks. Young vigorous patients who have had an uninterrupted recovery have gone home from the hospital at the end of two weeks without harm, but this is not a safe practice. If no pus is present the wound may not require dressing oftener than once a week. At the end of the fourth week the patient may safely be allowed to return to her home, but should be provided with an abdominal bandage, which she should be advised to wear for six months or a year, and to abstain, so far as possible, from overwork, lifting heavy weights, or any straining occupation which might have a tendency to produce ventral hernia.

Accidents.—Accidents may occur during ovariotomy from the administration of the anesthetic or from the stripping off of the peritoneum from the abdominal walls or the intestines. The cyst wall may be accidentally ruptured while separating adhesions. Bleeding points may be overlooked, and the patient's life lost from hemorrhage after the closure of the incision. Ligatures have slipped off the pedicle; catgut has become untied; intestines, omentum, or bladder have been injured when opening the abdominal cavity, or torn while separating adhesions. None of these accidents should occur in the hands of the average conscientious operator. Sponges, forceps, scissors, rings, and eyeglasses have all been lost in the abdominal cavity during an operation, and have been searched for subsequently or found during a post mortem.

Obstruction of the bowels may be caused by paralysis of or kinks or twists in the intestines. Fistulæ may follow the use of infected ligatures, and ventral hernia may occur to torment the patient in some cases to such an extent that her sufferings are greater after her operation than they were from the condition which made the operation necessary.

Mortality.—The mortality from uncomplicated ovariotomy at the hands of most experienced surgeons is about 2.5 per cent.

Incomplete Ovariotomy.—This is sometimes made necessary by the character of the growth and by the extent and density of its adhesions. Proliferating cysts, the pedicles of which have been subjected to even temporary torsion, exposed to traumatism or infection, or which have become the seat of secondary malignant changes, may become so intimately involved with the intestines that they can not be removed without irreparable, if not fatal, injury to the latter. Under such circumstances it may be found expedient to remove a part of the cyst wall, stitching the remainder to the margins of the intestinal incision, an operation which Pozzi designates as the marsupialization of the patient. It is always a matter of great importance to determine when this step should be taken. As a rule, exemplified in the reported cases of VanderVeer, it should be done in the presence of the foregoing complications, particularly when the operation has already been so long or so difficult that, if still further prolonged, the patient will die from hemorrhage or shock.

166. PROCEDURE OF INCOMPLETE OVARIOTOMY

In fixing the edges of the sac to the edges of the abdominal wound it is important to see that all bleeding points in the former are brought under control. This can be accomplished, as a rule, by means of ligatures; but in exceptional cases the cyst walls will be found to be of such an embryonic character that they will not sustain a ligature, when it will becomes necessary to resort to the cautery, to styptics, or to sponge packing to control the bleeding. Cases have been reported in which the remnant of tumor tissue has sloughed away through the opening left by this operation, the patient making an eventual recovery. Fortunately complications rendering this course necessary are now of relatively rare occurrence.

ADENOMATA OF THE BREAST

Adenomata of the breast are derived from the epithelium of the acinous glands, and present glandular characteristics in their composition. They are, however, modified by admixture and other histologic elements, which fact results in their classification as follows:

(a) Pure adenomata.
(b) Adenofibromata.
(c) Adenocystomata.
(d) Fibrocystadenomata.
(e) Papillary cystadenoma.

For the purposes of this work these varieties, as pathologic entities, require but cursory consideration.

Pure adenomata of the breast are of exceedingly rare occurrence. Gross saw one case in 115 breast tumors, and Billroth one in 103 breast tumors. They are definitely localized nodular growths occurring at any period before middle life. On section they are white or flesh-colored, and on being scraped yield a milky fluid. They contain numerous gland acini, lined with a single layer of cubical epithelium. In some cases the epithelium is of the proliferating variety.

Fibroadenomata are firm, round, and ovoid growths, of different sizes, and generally multiple, but confined, as a rule, to one breast. They develop slowly, and vary in size from an English walnut to a small hen's egg, although they sometimes grow very large. After remaining quiescent for years they suddenly become active. Activity is shown particularly at the menstrual periods and during pregnancy.

Cystadenomata or polycystomata are movable, painless growths, showing themselves in women of early or middle life. The cysts are generally papillomatous. Their contents may be clear and thin, or opaque and thick. The ducts are more involved than the alveoli, and do not differ histologically from adenofibromata or periductalfibromata, except that secondary proliferation of epithelium has taken place.

Polycystadenomata are warty outgrowths with a connective tissue pedicle, having an epithelial covering. On section they show a characteristic outgrowth of connective tissue surmounted by luxuriant epithelium. They are generally caused by trauma.

Symptoms and Diagnosis of Adenomata of the Breast.—These growths are ordinarily painless. They are located superficially usually on the upper outer quadrant of the breast, although they may develop in any part of the gland. There is neither retraction of the nipple nor involvement of the lymphatics. Later they become lobulated. There is a sense of uneasiness on the breast.

Treatment of Adenomata of the Breast.—The treatment is exclusively surgical. It is frequently demanded by the inconvenience and mechanical discomfort occasioned by the growth. Sometimes they become very painful. As they occur generally in younger subjects the operative relief must have some reference to esthetic results.

167. WARREN PROCEDURE FOR PLASTIC RESECTION OF THE BREAST (RODMAN)

(1) The preliminary incision is begun at the lower border of the breast, opposite the middle of the outer arc of the lower inner quadrant, and runs along the lower fold and outer margin to the inner border of the axilla, thus severing the lymphatic connections of the breast with the axillary plexus of lymph glands. The incision should be carried down to the lower border of the pectoralis major muscle, which should be freely exposed.

(2) The dissection is then carried along through the loose connective tissue, which lies between the pectoral fascia and the posterior layer of the fascia in which the mammary gland is contained.

(3) With the left hand the operator reflects the breast upward, so that the posterior surface becomes exposed in its entire length. The gland tissue can now be seen through transparent fascia and easily inspected, and any cysts present readily seen.

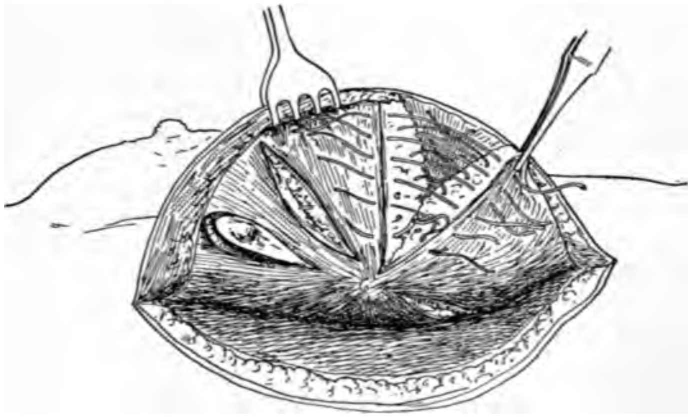


FIG. 354.—(167) WARREN PROCEDURE FOR ADENOMATA OF THE BREAST. (Rodman.) The neoplastic lobules have been excised and the gland permitted to drop back upon the pectoralis, when the remaining lobules resume their normal relations. The interlobular incisions are being closed with sutures preparatory to the replacement of the gland.

(4) Usually one or two lie in the same quadrant, which can be

removed by a V-shaped incision without opening the cysts. The apex of the V lies directly under the nipple in the center of the gland.

(5) Radiating from this point incisions can be carried into the gland tissue in all directions, exposing and bisecting all small cysts, so that none remain which have not been laid open (Fig. 354). A second V-shaped incision may occasionally be necessary, but this is rarely the case.

(6) The next step after arresting hemorrhage is to close the V incision with two rows of catgut sutures, one along the anterior border and one bringing the posterior edges into contact.

(7) The gland is then dropped back on the pectoral muscle, and it will be found that the various incised portions resume their natural position and fit accurately together.

(8) The gland is then anchored to the pectoralis major muscle at the outer edge.

(9) Another row of sutures is advisable to hold together the deep layers of the superficial fascia before the outer edges of the wound are closed with silkworm gut. The buried sutures remove tension from the surface sutures.

(10) The dressing is so applied as to produce lateral compression of the two hemispheres of the breast.

It has been stated that this operation endangers the nutrition of the gland by interfering with its blood supply, but Rodman states that this statement is based upon an erroneous conception of the manner in which the blood vessels of the breast are arranged.

ADENOMATA OF THE KIDNEY

Pathologists and embryologists have practically arrived at a consensus that these growths are derived from misplaced elements of the suprarenal glands (see Hypernephromata).

ADENOMATA OF THE RECTUM

Adenomata are found more frequently in the rectum than in any other part of the intestinal canal. In fact, they occur there with greater regularity than almost any other tumor. Benign or simple adenomata are common in childhood and comparatively rare in adults, unless preceded by some other disease with a coincident discharge. On the other hand, malignant adenomata usually attack those past middle life, and are rarely seen in children.

All rectal tumors have a tendency to become pedunculated, because they are dragged down daily by the feces. The word polypus is commonly applied to any growth in this locality having a narrow or pedunculated laminar attachment with a large movable pendulous extremity. Van Buren once said that "in proportion as a tumor becomes pedunculated its danger of being malignant lessens." Gant's experience has been in accord with Van Buren's. Nevertheless, it is at times difficult to distinguish between the benign and malignant forms of adenoma. In rare instances either of these growths may be found in great numbers scattered over the entire rectal mucosa; they are then distinguished as disseminated adenomata.

Symptoms and Diagnosis.—Adenomata of the rectum vary in size from that of a pea to that of an English walnut. The symptoms depend largely upon the size, location, number, and condition of the tumors when seen. When situated high up in the rectum or sigmoid they manifest their presence by irritating the mucous membrane, causing a sensation of uneasiness and the discharge of considerable mucus. Occasionally they cause invagination, tenesmus, and straining. If ulcerated they bleed, and when located near the anus they protrude during stool. As a rule, they cause little pain unless strangulated.

Treatment.—Ordinary polypi are easily cured when within reach. They may be clamped with Gant's clamp, cut off, and the stump thoroughly cauterized with the Pacquelin cautery. When a cautery is not available ligature and excision will prove quite as effective, but will cause more pain. When small they may be seized with forceps and twisted off; when high up in the rectum the snare is sometimes serviceable; Gant prefers in such cases to seize the growth with a long-handled clamp forceps and allow it to remain *in situ* until it comes off of its own accord. Medication in these cases will prove unsatisfactory. Once in a while polypi come away spontaneously or are detached by fecal accumulations.

[illegible]

[illegible]

CYSTOMATA OF THE VULVA

[illegible]

[illegible] of the vulvar organs. [illegible] are symptoms. [illegible] slight mem- [illegible]

Treatment. [illegible] excision.

CYSTOMATA OF THE VAGINA

[illegible] possess di- [illegible] Gartner, they are [illegible] presenting themselves for [illegible]

[illegible] rarely more than [illegible] themselves in rows.

[illegible] upper part of the vagina, especially growing from the anterior wall, though they may develop in the lateral walls, as well as in the lower part of the vagina.

They vary in size from a pea to a hen's egg, though Veit has reported a case in which the cyst reached the size of a fetal head. In most instances, however, they grow slowly, and rarely reach a large size.

Age appears to have no influence in their etiology, as they occur in virgins as well as in women who have borne children.

Many theories have been advanced in explanation of the origin of these cysts. Rothrock, reviewing these theories, states that Huguier and Guerin thought they always grew from glands which were present in the walls of the vagina. In later years the tendency has been to regard all cysts of the vagina as having their origin in the remains of the Wolffian bodies. While a certain proportion of cysts no doubt originate in this manner, this theory fails to explain the origin of many cysts which develop in locations remote from such embryonal structures and which are very superficial. More recently Preuschen was able to demonstrate the actual existence of duct-like glands in a number of cases examined *post mortem,* which were lined with columnar epithelial cells, from which fact he attributed to those cysts occurring in locations other than the anterior or lateral walls of the vagina a glandular origin. It is evident, therefore, that we must admit the glandular theory as explaining the origin of a certain proportion of smaller cysts, while most of the larger cysts develop from the embryonal remains of the Wolffian ducts. In addition to these theories the possibility of dislocation of islands of epithelium which become imbedded in the submucous tissue, the result of traumatism, for example, childbirth, or operations on the vagina, which afterward give rise to cysts, must always be borne in mind. Finally, dermoid cysts may develop in the wall of the vagina, usually in the rectovaginal septum.

Cysts of the vagina are rounded tumors, frequently biscuit-shaped, hemispherical, or fusiform, with tense elastic walls encroaching on the lumen of the vagina. Rarely they may assume a polypoid shape, having protruded to such an extent as to form a pedicle.

The cyst wall varies much in thickness. In case the cyst is large the wall may be very thin, and the contained fluid of a clear color, giving the cyst a bluish translucent appearance.

The cyst contents are usually a thin, clear, yellowish, transparent fluid, though they may be viscid, turbid, and even of a dark brown color from the presence of disorganized blood. Microscopically the cyst contents are poor in organized elements, though occasionally there are to be found mucous corpuscles and groups of desquamated epithelial cells, cylindrical and squamous, together with cholesterin crystals and fatty detritus. Should the cyst become infected by pyogenic microorganisms suppuration takes place, and the contents will then consist largely of pus.

Vaginal cysts are usually simple, though occasionally the remains of septa may still be observed. Rarely multilocular cysts have been described, Poupinel having met with one composed of fifteen small cysts. On microscopic examination the cyst wall is made up largely of fibrillary connective tissue, though in a certain number of cysts smooth muscle fibers are present, more or less uniformly distributed. Great difference is noted in the epithelial lining of vaginal cysts. Usually it consists of a single layer of columnar epithelial cells, which may be ciliated. Occasionally the epithelial lining is polymorphous, consisting of cuboidal, cylindrical, and squamous cells, or the cylindrical cells may be entirely replaced by the squamous type. Veit attributes this change, especially when the cysts are large, to the pressure of the cyst contents. In a few instances invaginations of the epithelial lining into the cyst wall have been observed, the occurrence of which has been advanced as proof of the glandular origin of such cysts.

Symptoms and Diagnosis.—These growths are generally painless. Often the first symptom to attract attention is the inconvenience they occasion at sexual intercourse, or in douching the vagina. In other cases they are not noticed until they present at or protrude from the vulvar orifice. They are generally spherical, or, when pedunculated, they are pyriform. Their walls are generally thin, which, with their clear contents, gives them a grayish-white, sometimes a glistening, appearance. They may be mistaken for uterine polypi, from which they are distinguished by their fluctuating character, and, on specular or even digital examination, by the fact that they have no peduncular connection with the cervix. They may be mistaken for enterocele of the cul-de-sac (q. v.). They are distinguished from this condition by the fact that they do not disappear when the patient is placed in the Trendelenburg position.

Treatment.—The treatment is by enucleation.

168. PROCEDURE FOR ENUCLEATION OF CYSTOMATA OF THE VAGINA

(1) The cyst is exposed by retractors, which draw the walls of the vagina away from it.

(2) A transverse incision is made through the vaginal membrane down to, but not through, the cyst wall.

(3) A slight dissection is made with gauze separating the cyst from the vaginal membrane, which is then seized with forceps.

(4) The enucleation of the tumor, which is generally sessile, then proceeds by gauze dissection, if possible, without rupturing the cyst.

(5) When the enucleation is completed all bleeding points are to be controlled by catgut ligature, if necessary, and the incision in the vaginal membrane closed by interrupted sutures of the same material.

CYSTOMATA OF THE UTERUS

(Cystic Cervix)

Cysts of the uterus having clinical importance may be classified as (a) follicular cysts and (b) fibrocysts. The former only remains to be considered in this connection, as fibrocysts have been considered elsewhere (see Myomata of the Uterus and Adenocystomyomata).

Follicular cysts are retention cysts, derived from the glands of Naboth. They are restricted to the cervix, where they occur as small spherical nodules varying in diameter from 0.3 to 1 cm. They are almost uniformly multiple, and large numbers of them may exist at one time. Their wall consists of an outside epithelial layer derived from the cervical mucosa, a scanty fibrous middle layer lined with endothelium. Their content is a clear viscid mucus.

These cysts, if destroyed, do not return, but others are prone to develop from the numerous remaining muciferous follicles.

They may occur without determinable cause. They are a frequent concomitant of the involutional changes incident to the menopause. In younger subjects they often occur after recovery from acute infection of the upper vagina and cervix, especially gonococcus infection.

Symptoms and Diagnosis.—It would seem that in a condition so obvious nothing should be said with reference to symptoms and diagnosis additional to the description already given. I have, however, twice had occasion to rescue women from a threatened vaginal hysterectomy for carcinoma, for which cystomata had been mistaken. It is important, therefore, to state that the spherical character of the nodules should be considered pathognomonic. The diagnosis ought to be made by the educated finger alone in two seconds after it reaches the cervix. If, however, the examiner has a remaining doubt, he may puncture a cyst with the point of a bistoury, when the exuding mucous content will establish the nature of the condition.

Treatment.—The treatment is made important because these cysts are a source of sensitiveness to the cervix and keep up a leukorrhea. For this reason they should be destroyed. It is not sufficient to puncture them, as the puncture wound will heal and the cyst will return. They should be destroyed with the cautery.

Echinococcus Cyst of the Uterus.—See Echinococcus Infection of the Uterus.

CYSTOMATA OF THE FALLOPIAN TUBES

These cysts are of rare occurrence, of insignificant size and of but little clinical interest. They may originate either within the serous coat or the muscularis, although their favorite site of development is from the vestibular mucosa. It is probable that they are inflammatory products, in the sense that mucous follicles have become occluded and thus converted into retention cysts. Sutton has reported a large cyst which developed in the muscularis and attained the size of a walnut, the probable origin of which was similar to that observed by Kiwisch in the submucosa, and which was demonstrably of inflammatory origin. A. Martin has published an interesting picture showing cysts that develop about the vestibule (Fig. 355).

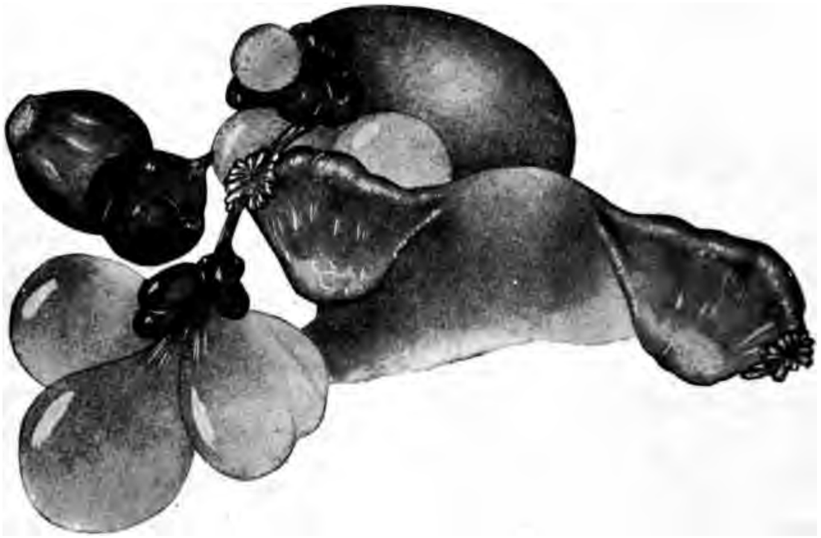


Fig. 355.—Cystomata Growing from the Fimbriæ of the Fallopian Tubes. (After Martin.)

These growths are encountered clinically only in connection with operations undertaken for other purposes.

CYSTOMATA OF THE OVARIES

(*Cystic Ovaries*)

Cystomata of the ovaries are divisible into:

(a) Cysts of the Graafian follicle.
(b) Cysts of the corpus luteum.

(c) Tuboövarian cysts.
(d) Adenomatous cysts (see Cystadenomata under Adenomata).
(e) Dermoid cysts.

The first three varieties will be considered under this caption:

(a) CYSTS OF THE GRAAFIAN FOLLICLE

Follicular cysts, as these formations are generally designated, have been variously named, as hydrops folliculi, hypertrophy of the follicle (Ziegler), small cystic degeneration (Hegar), and follicular cysts.

Slightly dilated follicles and small follicular cysts are distinguished by no essential difference in appearance; so that the clinician is often perplexed to determine what constitutes the degree of cyst formation to be designated pathologic.

Various theories have been advanced in explanation of the development of follicular cysts, but Rothrock finds on careful investigation of the subject that, in the majority of cases, they are probably due to previous inflammatory changes in the ovary, the fibrous tunic of which has become thickened, thus preventing the rupture of the follicle, and are, therefore, retention cysts. According to Olshausen, they frequently develop in the following manner: In the beginning the ovary will contain several dilated follicles which materially increase its size; sooner or later one of the follicles takes on abnormal growth and expands on the surface of the ovary in the direction of least resistance. Pressure from the increasing contents produces atrophy of its wall, which becomes thin. When the cyst reaches some size it replaces the ovary, which has now become flattened from pressure, and appears as a mere thickening of the basal wall of the cyst, while the peripheral wall of the cyst is thin. As a rule, they develop on the surface of the ovary, the walls of which are thick and consist largely of ovarian tissue. In many cases, however, the deep stroma is studded with small cysts. Follicular cysts may be freely movable and even pedunculated, or they may develop within the ligament.

They vary in size from that of a pigeon's egg to that of an orange, though exceptionally much larger cysts have been met with, reaching the size of an adult's head.

The wall of the cyst varies in thickness, and the external surface may be smooth and shining, or rough from adhesions. The inner surface of the cyst wall is, as a rule, smooth, shining, and fascia-like, though occasionally a few small, wart-like papillary growths are observed springing from the surface.

Follicular cysts are usually unilocular, though sometimes two or more cysts may fuse, in which case the remains of partitions or trabecula-like formations may be seen.

[illegible] THE [illegible]

[illegible] with per- [illegible] and [illegible] sediment [illegible] corpuscles [illegible]

[illegible] connective tissue, [illegible] epithelial lining.

b) CYSTS OF THE CORPUS LUTEUM

According [illegible] and Frankel, cysts may [illegible] describe [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

occasionally cysts of the corpus luteum may be lined by epithelium. The character of the epithelium is usually cylindrical, but may be cuboidal or approach the squamous type. The cells are not always regularly arranged, but may be here and there set diagonally to the surface.

The etiology of these cysts is not known. The frequent coexistence, however, of chronic oöphoritis suggests that the chronic hyperemia incident thereto may have been the determining cause of the increased transudation which gave rise to cyst formation.

Blood cysts, hematomata, constitute another variety of cysts of the corpus luteum, which are not so uncommonly met with, and are of much pathological interest and clinical significance.

Attention has been called to these cysts by certain French writers, as Robin, Rollin, Doleris, Petit, and especially Pilliet. More recently Orthmann has made a careful and exhaustive study of these cysts, and concludes that they originate from hemorrhage into the corpus luteum.

These cysts are usually superficial, and are most frequently found at one or other pole of the ovary. They are round or oval in shape, and vary in size from that of a walnut to that of the head of a newborn child. They are frequently firmly adherent to the surrounding structures, and may be bilateral.

It is not always possible to distinguish between these blood cysts and primary cysts of the broad ligament into which hemorrhage has taken place, and they may be confused with ovarian pregnancy.

The cyst contents vary. In small cysts the blood may be coagulated, while in the larger ones it is usually liquid and of a reddish, dark brown, or chocolate color. On section one finds the cyst wall composed of the characteristic structure of corpus luteum cysts.

In small as well as in large cysts the inner wall is uneven and more or less strongly folded, and is of a yellow or brown color.

The microscopic appearance of the wall of the cyst is in many cases similar to that of corpus luteum cysts already described, while in others there are present many of the histological changes occurring in the various stages in the process of regeneration of the normal corpus luteum. Like corpus luteum cysts, they may sometimes be lined with epithelium.

(c) TUBOOVARIAN CYSTOMATA

These cysts, of rare occurrence, involve both the ovary and the Fallopian tube. Various theories have been advanced in explanation of such cyst formation, but, from the great variety which have been described, it is evident that no one theory will explain all cases. It is probable, however, that pelviperitonitis with resulting adhesion of the pavilion of the tube to the ovary is primarily an important factor in their formation.

These cysts are usually unilateral, though they may be bilateral, and they vary in size from that of a pigeon's egg to that of a closed fist, and exceptionally larger ones have been observed. The junction of the tubal portion of the cyst with the cyst proper is marked by a sharp flexion, giving it the peculiar and characteristic appearance of a retort.

As a rule, the larger portion of the cyst is developed from the ovary, and is round or oval. The cyst wall is usually smooth, if not adherent, and in large cysts may be quite thin. In most instances it is more or less adherent to the surrounding structures.

Tuboövarian cysts are unilocular, and not infrequently they communicate with the uterine cavity, through which the contents are periodically emptied. The opening between the ovarian and tubal portions of the cyst varies in size, and is frequently guarded by a valve-like formation, the remains of the septum.

The cyst contents consist usually of a clear serous fluid similar to that of follicular cysts. They may, however, be turbid, blood-tinged, or chocolate color from disorganized blood.

Histologically the wall of the cyst is composed of connective tissue, while in the tubal portion atrophied muscle fibers may be observed. The epithelial lining of the ovarian portion of the cyst consists of low cylindrical, cuboidal, or spindle-shaped cells, or may be without epithelial lining, while the tubal portion of the cyst is lined with cylindrical epithelium, which is frequently ciliated.

SYMPTOMS AND DIAGNOSIS OF CYSTOMATA OF THE OVARIES

Small benign cysts of the ovary, especially those of the follicular and luteal types, often comprise the most painful condition with which a woman can be afflicted. This is uniformly true when the tunica albuginea becomes indurated and atrophic and inelastic over the entire surface of the ovary. In these cases it is impossible for the Graafian follicles to rupture. The natural result is their progressive accumulation within an inelastic capsule with a correspondingly progressive pressure upon terminal nerve filaments within the organ. This pain is aggravated by every slight movement, by every jar of the body, and it is especially aggravated by the physiologic congestion preceding menstruation.

In certain cases, in which the cyst-forming process and the change in the tunica albuginea are both limited, the pain is much less, but shows a tendency to increase with the advance of the disease.

General neurotic disturbances, due in large part to the persistence of ovarian pain, too, make their appearance. The progressive diminution of the internal secretion of the ovary probably plays a part in upsetting the nervous equilibrium.

On examination tumefaction in the ovarian region may or may not be present. When present it is generally indicative of tubal disease. The ovaries in these cases are generally normally impalpable, although occasionally they may be displaced, when they can be felt in the cul-de-sac. The effort to palpate, then, either by digital exploration within the vagina or by bimanual examination elicits extreme pain in all typical cases. The presumptive diagnosis rests upon these symptoms. The positive diagnosis can be made only by exploratory incision.

TREATMENT

It is obvious from the pathology of this condition as just presented that neither cure nor relief can be expected without removal of the diseased condition. When this embraces all of the ovary, all of the ovary must be removed to secure relief from the intolerable pain. In certain cases, in which neither all of the tunic or the stroma is involved, resection of the ovary can be practiced.

This leads to a division of the treatment into (a) radical and (b) conservative.

(a) The radical treatment implies the removal of the ovaries.

169. PROCEDURE FOR THE COMPLETE EXTIRPATION OF THE OVARIES FOR CYSTOMATA (OOPHORECTOMY)

(1) The abdomen is opened in the usual way, with the patient in the Trendelenburg position.

(2) The pelvis is carefully explored to detect any complicative conditions, and especially to determine the condition of both ovaries.

(3) The ovary and Fallopian tube of the affected side are brought up and the ovarian artery, with the ovarian pelvic ligament and the ovarian branch of the uterine artery, is ligated.

(4) The Fallopian tube is excised at the uterine extremity and, with the ovary, cut away from the crest of the broad ligament.

(5) The leaflets of the broad ligament are stitched with a continuous suture of fine catgut.

(6) The other side, if similarly diseased, is treated the same way, and the abdomen closed.

The Fallopian tube is removed with the ovary (salpingo-oöphorectomy), because, with its ovary removed, the tube becomes a meaningless structure potential only for mischief.

170. PROCEDURE FOR THE CONSERVATIVE TREATMENT OF CYSTIC OVARY

(1) The abdomen is opened in the usual way, with the patient in the Trendelenburg position, and the affected ovary is brought up.

(2) (a) If a portion of the hilum, or even a greater zone of tissue, is apparently free from disease, the diseased portion may be excised by an elliptical incision.

(3) The remaining portion of the ovary is then stitched up with a deep hemostatic suture of catgut and dropped back.

(4) (b) If there are comparatively few cysts, large but discrete, they may be opened either with the scissors or the electric cautery. If the scissors are used a circular disc should be cut out of the cyst wall; if a simple puncture is made the opening will close.

The conservative treatment of the ovary for this condition has as advantages the following facts: (a) the remnant of the ovary is probably capable of ovulation; (b) it is sufficient to perpetrate menstruation; (c) it is capable of deferring the menopause; (d) it can furnish enough internal secretion to maintain the rhythmic action of the system. It is not possible in any given case to promise which, if any, of these results will be realized. I have had something over twenty cases in which women have conceived after partial resection of both ovaries. I have had many more failures, in a number of which it has been necessary to do a secondary operation of ablation.

On the other hand, the conservative treatment of the ovaries for this condition should be undertaken with the distinct understanding that: (a) the process of cystic degeneration is generally progressive; (b) cysts already formed may be located deep in the remaining stroma and thus escape detection; (c) the condition, if not already developed in the other side, is liable to do so; and (d) the ovaries, in the majority of instances, remain painful after conservative treatment. These facts should be definitely stated to the patient in advance, and her verdict should control in the operation.

CYSTOMATA OF THE PAROVARIUM

A cyst of the parovarium consists primarily of an accumulation of water in a tubule of the parovarium.

These cysts are generally single, unilateral, and unilocular, and contain a clear fluid.

In their histogenesis, pathology, clinical manifestation, and operative treatment they should be recognized as distinct from ovarian cysts.

which they frequently resemble in size and gross morphology. They are, nevertheless, peculiar to organs that are as different from the ovary as is the Fallopian tube; and, just as the tubes and the affections characteristic of them are dealt with by themselves, so should the diseases of the parovarium and its peritoneal coverings be treated distinctly and form a chapter of their own.

Parovarium is the term first used by Kobelt. Waldeyer called it epoöphoron, in contradistinction to the paroöphoron, which lies closer to the uterus and represents the vestiges of the corpus Geraldes of the male, the parepididymis. The organ was formerly, and still is, quite generally known also as the corpus Rosenmüller, because Rosenmüller gave the first description of it.

Briefly defined, the parovarium is that portion of the female internal genitalia which represents the atrophic or rudimentary remnant of that part of the Wolffian body that would have become the epididymis in the male.

It is located between the two folds of the broad ligament, and consists of a number of small "closed" tubules, running transversely in a fan-shaped arrangement from the ovary toward the Fallopian tube. These tubules can be easily detected by the unaided eye if the normal mesosalpinx is spread out and held up against the light (Quain). The number of tubules varies, as a rule, from 10 to 15, though, according to Coe, there may be only half a dozen, or as many as 25 or 30. They have no openings; they measure from a little less than 0.5 millimeter to 1 millimeter in diameter; their walls are 0.05 millimeter in thickness, and consist of an external annular membrane, and an internal membrane of longitudinal fibers (Olshausen), lined with cuboidal or low cylindrical, and sometimes ciliated, epithelium; and they are surrounded by several layers of spindle cells, apparently non-striped muscular fibers (H. A. Kelly). The longest and largest of these tubules, which is the remnant of the Wolffian duct, runs parallel to the Fallopian tube along the base of the fan formed by the rest, and then extends to the side of the uterus and becomes lost in the vaginal wall. According to Olshausen, the scanty contents of these tubes coagulate on the addition of acetic acid. In some of the lower animals, the sow, for instance, the Wolffian duct persists and is known as the duct of Gärtner. Occasionally traces of this duct may be seen in the human female upon cross section of the cervix or body of the uterus. Those of the vertical tubules terminating near the outer margin of the broad ligament are, by some authors, called Kobelt's tubes, and it is at their extremities that very often small transparent cysts develop, the so-called hydatids of Morgagni.

Cysts developing in the broad ligament originate chiefly from the epoöphoron (parovarium). Occasionally, though rarely, cysts may arise from the paroöphoron, which lies close to the uterus. When small we can distinguish between them only by their location, the former occupying the outer and upper, the latter the inner and lower, portion of the broad ligament; when large, whether pedunculated and extending into the peritoneal cavity or subserous, their origin can not be positively determined.

The parovarian cystoma, according to Fischel, is the result of a cystic degeneration of that part of the parovarium which not only extends into the hilum of the ovary, but is found where Pflüger's loops begin to have granulosa-epithelium, and that is within the cortical layer of the ovary itself. The ovarian tissue, during the development of these tumors, either atrophies or participates in the formation of the same. These growths have the same physical characteristics as those that form from the epoöphoron and paroöphoron respectively, because they are in reality of parovarian origin. They, too, remain intraligamentary, but frequently become pedunculated, and differ from the rest only in containing ovarian tissue, which, however, can not always be found.

Up to 1865 little or nothing was known of broad-ligament cysts. It is through the observations and reports of cases by Prochownik, Schröder, Olshausen, Spiegelberg, Gusserow, and others that we know something definite concerning these neoplasms. But to Wilhelm, Fischel, and Olshausen (1880) belongs the credit of first describing minutely, macroscopically and microscopically, their structure and relations, which, as will be seen, are of no little importance.

Formerly these cysts were considered quite rare. It is now well known that they are much more frequent than is ordinarily supposed. Zinke insists that, while they are met with less often than ovarian cysts, it must not be forgotten that many a cyst has been diagnosticated as belonging to the ovary which in truth was parovarian in its origin.

Cysts of the broad ligament may develop at any time of life, but more especially after the period of puberty. Olshausen's youngest patient was fifteen, Kelly's oldest seventy-three years of age. As a rule, they are monocysts, and vary in size from 1 centimeter to 40 centimeters in diameter. The small cysts connected with, or springing from, Kobelt's tubes usually remain small, and do not give rise to any symptoms.

Both broad ligaments may be affected with one or several cysts at the same time; or one cyst may so develop as to occupy both ligaments in course of time.

Every parovarian cyst is necessarily intraligamentary. In a certain sense they remain so; notwithstanding that in one case they may grow into the peritoneal cavity and become more or less pedunculated, and that in the other the direction of growth is toward the pelvic floor and retroperitoneal space. In the latter case the tumor spreads the leaves of the ligament or ligaments apart and becomes, to a great extent, if not entirely, subserous in its location. Again, the tumor may dissect up the parietal peritoneum anteriorly and posteriorly, or both. Their conduct in this respect is like that of the solid tumors of the broad ligament already described. In consequence of the varying distribution of the parovarian cysts they vary in shape and give rise to different symptoms at a certain period of their existence. Those cysts which develop in the direction of the abdominal cavity will have more or less of a pedicle. It is to be remembered in this connection, as pointed out by Zinke, that when the base of the ligament is not taken up a pedicle may be often formed by traction upon the tumor during the operation. Such tumors will be perfectly oval in shape and covered with peritoneum in every part. Those cysts that grow downwardly, separating the two layers of the broad ligament, become to a great extent irregular in outline, are covered by peritoneum in part only, and, of course, have no pedicle.

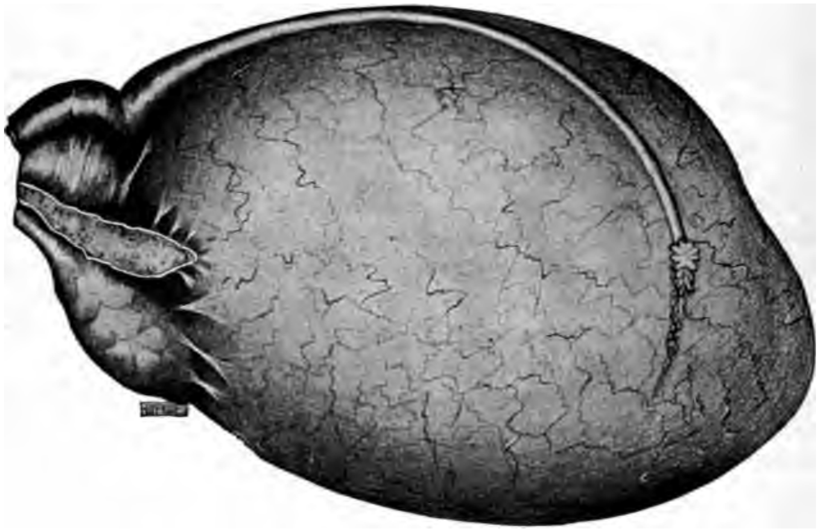


FIG. 356.—A PAROVARIAN CYST DEVELOPING BETWEEN THE FOLDS OF THE BROAD LIGAMENT AND, WITH ITS UPPER SURFACE, LIFTING THE FALLOPIAN TUBE FAR ABOVE ITS NORMAL LOCUS. In this case the tube was lifted nearly to the umbilicus and was stretched until it was 15 cm. in length.

Parovarian cysts are, then, either entirely or in part covered with peritoneum derived from the broad ligament. The outer surface of the cyst or cystoma is, therefore, smooth, and immediately beneath it can be seen the blood vessels running in every direction. The tube and its fimbriated extremity are very much stretched, and extend over the upper and posterior surface of the tumor, to which they are loosely, sometimes firmly, adherent (Fig. 356). The fimbriæ, especially the fimbria ovarica, are spread open and much elongated. The tube, as a rule, continues patulous and unchanged in its structure. The ovary, often perfectly normal, may be found suspended from, or flatly attached to, the lower and posterior surface of the growth. When the ovary cannot be found it may be atrophied and lost in, or become part and parcel of, the tumor itself. The latter event occurs, according to Fischel, in the ovarian cystomata of parovarian origin.

The cyst wall is made up of peritoneum, glandular, muscular (smooth), and connective tissues. Its inner surface is lined with ciliated epithelium either alone or in connection with the cylindrical variety (Fig. 357). The thickness of the wall varies, usually from 0.3 to 3.5 millimeters, although at times it may be much thinner or thicker; but it is nearly always uniform and seldom shows transparent patches. Its inner surface is corrugated, and not infrequently studded extensively with papillary formations. The corrugation Fischel believes to be due to the presence of muscular fibers in the cyst wall; Olshausen and others, however, do not agree with him. The smooth muscular fibers are found nearer the outer surface of the wall, and run in every possible direction; they may be absent in spots.

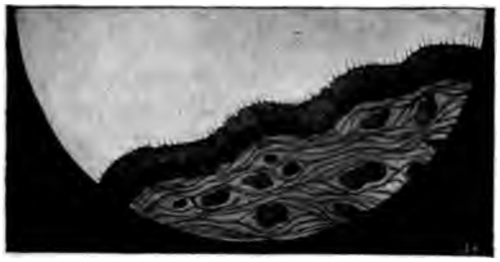


FIG. 357.—SECTION FROM THE WALL OF A PAROVARIAN CYST, SHOWING THE CILIATED EPITHELIAL AND UNDERLYING CONNECTIVE TISSUE LAYERS.

The glands found by Fischel, which he states are lined with a low cylindrical epithelium, can not always be detected. Olshausen believes that both glands and papillary formation are more generally absent than present.

The fluid contents of the sac, too, vary much in color, consistence, and specific gravity. This, according to Zinke, depends mostly, if not always, upon the age and size of the tumor and the amount of blood that from time to time may escape into it in consequence of occasional rupture of blood vessels, the result of torsion of the pedicle, distention or puncture of the cyst wall, or external injuries. In by far the great majority of the small and medium-sized tumors the fluid is clear and limpid, like water, sometimes of a yellowish tinge, sometimes opalescent;

and contains little or no albumin. The specific gravity is exceedingly low, 1.002 to 1.004. Under these conditions, too, the cyst wall is often flaccid. When the cyst is old and large the fluid is likely to be thick, much darker in color (greenish-brown or black), and may contain considerable albumin and have a high specific gravity, 1.022, as in Schatz's case. Sometimes blood coagula, old and of recent date, may be discharged from the cyst when opened. Spiegelberg says that the parovarian cysts may also contain "paralbumin, granular débris, decolorized and shriveled red blood corpuscles, scattered white corpuscles, large granular fat cells, and plates of cholesterin."

The causes of intraligamentary cysts and parovarian cystomata are very obscure. Indeed, we must admit that we do not know. The following are merely of a speculative nature: menstrual congestion, hereditary predisposition, chlorosis during puberty (Scanzoni). Irritation, as from displaced or diseased pelvic organs and other sources, may be admitted as a probable cause. Olshausen states that they are rare in childhood; that no period of life is exempt, and that they are often associated with ovarian disease of the same or the opposite side.

Symptoms and Diagnosis of Cystomata of the Parovarium—Partly and completely pedunculated parovarian cysts, or cystomata free from all complications, may not give rise to any symptom whatever, except when they assume great proportions; and then the symptoms may be limited to enlargement of the abdomen, dyspnea, dulness, and distinct fluctuation on percussion. It is different when there is no pedicle and cysts develop, in part or entirely subserously. Pelvic discomfort and occasional pains may be present early, and may gradually increase in frequency and duration as the tumor grows and dissects up the pelvic and parietal peritoneum, and displaces the viscera concerned. Advice is sought early and examination usually permitted. Inspection of the abdomen may reveal some enlargement; percussion some dulness in the lower part of the abdomen; and bimanual examination a fluctuating swelling with upward, downward, anterior, posterior, or lateral displacement of the uterus and some of its appendages. Here, too, there will be noticed a steady augmentation of the symptoms. The bladder will become disturbed in its position, and this may cause frequent, painful micturition or even incontinence of urine. The rectum may be affected in the same way.

The symptoms, then, in all uncomplicated cases will vary according to the size, age, and locality of cysts. As the tumors are of very slow growth, and sometimes stationary, other conditions may give rise to complications, as, for instance, pregnancy, rupture of the cyst, torsion of the pedicle, diseases of the uterus and its appendages, etc. It is evident, therefore, that the diagnosis is not always easy, and that errors may be made. Fluctuation is nearly always very distinct and superficial as in ascites, and, if the cyst wall is flaccid, the percussion note may change slightly with the change in posture of the patient. If a spontaneous rupture takes place there may be no symptoms due to that fact. This, according to Zinke, may happen repeatedly, without even a suspicion on the part of the patient, and may be eventually followed by recovery. Rupture of the cyst, spontaneously or accidentally, has been followed by diuresis; often, in all observed cases, it is also followed by pain, in the absence of complications: and always by pain, sometimes by shock, and occasionally by sepsis and death, if this accident occurs in the presence of acute or chronic inflammatory suppurative complications.

That there are cases in which a diagnosis can be made can not be doubted. When we find a flaccid abdominal tumor, with distinct fluctuation and devoid of hard nodules, which is of slow growth, accompanied by a history of the absence of pain, and possibly of repeated rupture without serious consequences, it seems safe to conclude that we are dealing with a broad ligament cyst. But it may be wise not to be too positive even then. At the present high stage of development of abdominal and pelvic surgery puncture of any cystic growth for diagnostitial purposes must be mentioned only to be condemned.

To distinguish at the time of exploratory incision between a papillary parovarian cystoma and a multilocular cyst of the ovary we need only remember that the former is mostly, if not always, bilateral; that it is always intraligamentary, and that the inner surface of the cyst is lined by ciliated epithelium.

Treatment of Cystomata of the Parovarium.—The treatment is exclusively surgical and exclusively by removal of the cyst. In consequence of the morphology and relations of these growths this may be a very simple or a very difficult procedure.

When the cyst has become pedunculated and is free it can be removed by the simple procedure of ovariotomy (see Ovariotomy).

When, however, the tumor is strictly intraligamentary it may be dealt with by (a) enucleation or (b) by excision.

171. PROCEDURE FOR THE EXTIRPATION OF AN INTRALIGAMENTARY PAROVARIAN CYST BY ENUCLEATION

(1) The abdominal incision is made in the median line, and, with the patient in the Trendelenburg position, the cyst is carefully explored with the hand to determine its relations and possible complications.

(2) The cyst is tapped, if possible, anterior to the Fallopian tube

with a large Tait trocar, drawn out of the incision, and carefully emptied of any residual content.

(3) The ovarian artery is ligated at the pelvic extremity of the broad ligament.

(4) The uterine artery is felt for, and, if palpable, is ligated by passing a ligature with a dull-pointed carrier so sharply curved that it can be readily passed through the ligament, in, below, and out above the vessel to be tied.

(5) The peritoneal capsule is then split transversely on its anterior surface for a distance of 5 or 6 cm. down to, but not through, the cyst wall.

(6) The cyst is then enucleated by gauze dissection, the lower portion of the tumor being drawn out of the peritoneal incision as rapidly as liberated. As a rule, the entire sac can be easily liberated in this way, and without opening its posterior peritoneal envelope.

(7) If there is any hemorrhage from deep in the capsule it may be controlled by hot sponge packs. If this is not sufficient the points should be picked up and either tied or left under control of forceps pressure. If the hemorrhage is simply an extensive oozing it may be controlled by a sponge pack, the end of the sponge being brought out through an opening made in the vagina. This would better be done anyhow if the cavity is not entirely dry.

(8) The peritoneal opening and then the abdominal incision are closed in the usual way (see Surgical Principles and Practice).

This procedure has the advantage of leaving the ovary and Fallopian tube of the affected side in their normal state with full functional capacity. As a rule, the preliminary ligation of the ovarian and uterine arteries is sufficient to control all hemorrhage. In certain cases, however, anastomotic branches of the vaginal and uterine vessels cause more or less persistent hemorrhage, which can generally be controlled as indicated in the procedure just outlined. It is the possibility of this complication that gives importance to the ingenious although sacrificial technique devised by R. B. Hall, as follows:

172. HALL (R. B.) PROCEDURE FOR THE EXTIRPATION OF INTRA-LIGAMENTARY PAROVARIAN CYSTS BY EXCISION OF THE UTERUS AND APPENDAGES

(1) Open the abdominal cavity in the usual manner. Then tap the cyst and empty it.

(2) Next, ligate the ovarian artery on the tumor side at the pelvic border.

(3) Ligate the ovarian artery on the opposite side, outside the ovary if that organ is to be removed; inside it if it is to be left.

173. VOLBRECHT PROCEDURE FOR HYDROCELE OF THE ROUND LIGAMENT

Volbrecht operates upon hydrocele of the round ligament, when the sac is large and located high up, as follows:

(1) Make a section of the inguinal canal in its entire length.

(2) The sac is then isolated and cut away.

(3) A ligature is placed upon the pedicle.

(4) The canal is then sutured, layer to layer, as in the Bacini operation.

CYSTOMATA OF THE KIDNEY

Cysts as they occur in the kidney may be divided into two classes:

(a) Simple retention cysts.
(b) Polycystic kidney.

(a) Simple retention cysts are generally found in the parenchyma of the kidney near the cortex. They are usually simple, although they may be multiple. When multiple they occur in different parts of the organ and are never grouped, although two cysts may coalesce by the breaking down of their septum by pressure. They are generally small, although they may grow until they nearly fill the abdomen.

These cysts generally originate from the occlusion of a urinary tubule, although they may be derived from the capsule of Bowman.

Simple retention cysts of the kidney are generally symptomless in their early stages. The majority of them are found at autopsy. When they do induce symptoms there are generally pain in the kidney, albumin and other urinary signs of nephritis. At this time tumefaction may be discovered in the region of the kidney, and palpation will increase the discomfort. The positive diagnosis is made only by exploratory incision.

(b) Polycystic degeneration is characterized by the development of innumerable cysts in the kidney and the gradual transformation of its parenchyma into cystic structure.

It may occur at any period from early life to old age.

Both kidneys are commonly affected.

The disease, as observed by Bristowe, Pye-Smith, Henry Morris, and Wilkes, is sometimes associated with similar cystic degeneration of the liver and spleen.

The characteristic of this disease is that the entire kidney seems to have become a mere conglomeration of cysts, varying from 0.1 to

2 cm. in diameter. The kidney becomes greatly enlarged, but retains its shape.

The medullary and cortical substances are replaced by cysts.

The content of the cysts generally varies in both color and consistency. As noted by Morris, and in one of my own cases, it may be clear, pale, straw-colored, deep yellowish, purplish, or blood stained, giving to the kidney a richly mottled appearance. These fluids vary from serous, limpid, and transparent, or viscid, turbid, treacly, colloid, or pea-soup-like; or caseous, and sometimes even almost solid. Occasionally they are purulent. In describing the contents of the cysts Henry Morris states that they are acid or neutral in reaction, and consist of a large quantity of albumin, some urea, a variable amount of triple phosphates, molecules of fat, epithelium, crystals of cholesterin and of uric acid, blood corpuscles, and occasionally leucin. The colloid material in the smaller cysts is homogeneous; in some of the larger cysts it is disposed in concentric layers. In certain of the medium-sized cysts may be found little connective tissue vegetations covered with several layers of epithelium resembling the papillary proliferations in ovarian cysts. Ritchie states that there are diverticula containing renal elements—tubules and blood vessels—projecting into cyst cavities. The cysts do not communicate with the pelvis or calyces, but often with each other. They are closed cavities whose walls are excessively thin, composed of connective tissue and lined by a delicate layer of cubical or pavement epithelium. The original renal substance is atrophied and in some places is wholly removed, in other places portions remain unchanged between the cysts; and in other places, again, around, between, and even at a distance from the cyst wall the renal tissue is sclerosed and the arteries show signs of endarteritis and periarteritis.

The connective tissue varies in amount in different cases, and may be either very fibrous or hyalin. In most cases there is an increase, and in very advanced cases the increase may be considerable. Leukocytes and increased numbers of connective tissue corpuscles are seen even at a distance from the cysts, giving evidence of local irritation. All stages of changes are to be seen in the tubules and Malpighian capsules, from slight dilatation to actual cyst formation. In some of the capsules the remains of the glomerulus may be detected. The epithelium is undergoing degenerative changes, the nuclei are shriveled or absent and stain badly, and large epithelial shreds become detached from the walls of the cysts during the process of preparing the specimens.

The origin of polycysts of the kidney is obscure. It is thought by some that they are derived from the included remains of embryonic life, and by others that it is a peritubular sclerosis with contraction of the tubules and the resulting dilatation of the tubules of the Malpighian capsules. That the disease is related to softening or degeneration connected with fatty or colloid fatty changes is another theory, while Lejars, Wechselbaum, Saundby, and others look upon the whole process as essentially neoplastic. Morris considers the condition as identical in etiology and pathology with congenital cystic kidney.

Symptoms and Diagnosis.—Insidious in the beginning, this disease rarely has early symptoms pointing to the kidney, or they may be masked by symptoms referable to other organs. Uremia is an early symptom which may speedily develop coma and death. Usually the symptoms are those of a chronic interstitial nephritis, but without a tendency to dropsy. The local symptoms, when they develop, are those of pain and tumor, although the latter symptom is frequently absent. In 62 cases collected by Lejars tumor was present in only 18. Morris says that the urine in most cases is normal in amount, frequency, and constituents. One of my own cases was an exception, as there were pronounced polyuria, low specific gravity, and a minimum of solid elements—practically water. The woman died of uremic coma in the midst of polyuria. The gastrointestinal disorders are generally pronounced, while dyspnea is a frequent symptom.

The disease is slow, but always progressive in development. If one kidney only is affected life may not be destroyed for years. If both kidneys are affected, which is true in the majority of cases, the patient may last from one to two years.

Treatment.—Comparatively little is to be done. Operation may be of great benefit if only one kidney is involved—a fact which can be determined only by exploratory operation. In the present undeveloped state of knowledge relative to this disease it is safe in unilateral cases to act upon the hypothesis that the affected kidney may become the source of further development of the disease, and that it ought for that reason to be removed. It is true that the process may be masked in the kidney, which may in consequence be able to discharge the duty of both. This argument is urged by some against operation, but it loses much of its force in view of the fact that the diseased kidney has long since lost its function as an emunctory for other than the watery element of the urine. The objection that the removal of the diseased kidney develops disease in the other lacks confirmation.

The surgical treatment should, therefore, consist of an exploratory incision, ending in nephrectomy if found justifiable. The exploration should be made by median incision in front; the nephrectomy being done either across the peritoneum or by incision in the costoiliac space, as may be found most practicable.

CYSTOMATA OF THE BREAST

Cysts of the breast are divided into:

(a) Single retention cyst.
(b) Lymphatic cyst.
(c) Polycystic breast.
(d) Galactocele.
(e) Hydatid cyst.
(f) Dermoid cyst.
(g) Sebaceous cyst.

(a) A single retention cyst is due to the obstruction of a galactopherus by inflammation. The secretion thereupon accumulates and the duct above the occlusion dilates into a sac. There are spherical fluctuating masses, generally not painful, with a content of variable color. They should be extirpated.

(b) A lymphatic cyst is a retention cyst formed from the occlusion of a lymphatic space. These cysts may be single or multiple; they are round or oval, and are firm and hard. They are not painful, do not fluctuate, and the axillary glands are not involved.

They should be cut out in their entirety.

(c) Polycystic breast is a disease analogous to polycystic kidney (q. v.). It generally involves both breasts, which present hardened areas without a defined tumor. It has been presumed to result from chronic mastitis, but its cause is undetermined. Rodman believes that the disease should be designated fibrous and glandular hyperplasia with retention cysts.

Treatment is exclusively surgical, and consists in excision of the affected breast.

(d) Galactocele is a cyst containing milk or some product of milk. It is a retention cyst, due to the occlusion of a milk duct in a lactating breast. It is exceedingly rare, occurring most frequently during or just after lactation. It is most frequently caused by traumatism. It occurs as a single round swelling, generally located in the outer hemisphere of the breast. It may become as large as an orange, but is slow in development, remaining stationary for a long time. The fact that it occurs in a lactating woman is suspicious that the enlargement is a galactocele.

This form of growth should be removed by excision.

(e) Hydatid cyst of the breast is of exceedingly rare occurrence. Thomas found it 20 times in 1,897 cases of hydatid disease. It has not been recorded as a primary affection. Its occurrence with hydatid disease in other organs is, therefore, the essential diagnostic point.

Treatment consists in dissecting out the cyst when practicable. When this is made impossible by the extent of the disease the breast should be removed.

(f) Dermoid cysts of the breast, while they are said to occur, are so rare as to be negligible in a practical work.

(g) Sebaceous cysts of the breast generally originate in the glands of Montgomery, but may occur in any portion of the mammary integument. They are not painful, but their removal is generally asked for because of the deformity. They should be carefully enucleated.

CYSTOMATA OF THE RECTUM

Retention cysts filled with secretions and excretions, which may or may not have undergone degeneration, are at times found in and outside the rectum. They occasionally reach enormous proportions, Gant having removed one 8 inches in circumference. In one case they may be filled with firm sebaceous material, in another with a fairly thick whitish fluid. They cause no discomfort further than a fulness of the part affected.

Treatment.—The entire cyst wall should be carefully dissected out and the wound united with catgut, otherwise the cyst will refill.

CHAPTER VII

ADDITIONAL NEOPLASMS

Lipomata or fatty tumors are sometimes found about the vulva. Leopold reported a single case developing under the broad ligaments. They are occasionally found in the breasts. Wherever found they are relatively unimportant. If their size becomes burdensome, or otherwise interferes with health, they should be removed.

Enchondromata are sometimes found in the breasts, their cartilaginous content always, however, being mixed with other elements. They are not, therefore, true enchondromata. New growths composed of muscular and cartilaginous structures have been found in the rectum. The former is of more frequent occurrence than the latter, and is found in that situation with greater frequency than in other parts of the intestine. Nothing short of removal should be considered for their relief.

Myxomata, angiomata, and endotheliomata are of such rare occurrence in gynecologic practice that they may be said to be negligible.

NEOPLASMS OF VASCULAR ORIGIN AND VARICOSE CONDITIONS

The license for classifying this group of conditions under the head of neoplasms is found in the fact that in certain instances they result in tumor formation.

The principal conditions to which attention is called in this connection are:

(a) Varicose tumor of the vulva.
(b) Pelvic varicocele.
(c) Aneurysmal varix.
(d) Rectal varicosities (hemorrhoids).

VARICOSE VEINS OF THE VULVA

The venous plexus on one or both sides of the vulva may become varicosed. The condition is generally unilateral. When bilateral one side is generally worse than the other. The enlargement may be very great, Holden reporting a case in which the mass was the size of a fetal head, and in which the patient died of phlebitis. The rupture of such a mass has been followed by fatal hemorrhage.

The symptoms are pain and tumefaction and the diagnosis is self-evident.

Treatment consists in removal of the pressure which is the usual cause of the condition. This is generally due to pregnancy, the pressure from which may be relieved by placing the patient in bed and by wearing appropriate external supports. Large myomata and large cystadenomata causing this condition should be removed. In the presence of rupture the whole mass should be ligated by through-and-through sutures at the base and then cut away.

PELVIC VARICOCELE AND ANEURYSMAL VARIX

Pelvic varicocele, otherwise spoken of as ovarian varicocele and varicocele of the broad ligaments, consists of a more or less permanent dilatation of the veins of the pampiniform plexus.

Aneurysmal varix, as originally described by Pott, consists of a direct communication between an artery and a varicose vein, or between two aneurysmal arteries without any intervening sac, the communication having been established by erosion.

These two conditions, as they occur in the pelvis, generally coexist and are, therefore, here considered in conjunction.

It should be remembered, however, that aneurysmal varix is of rare occurrence. Varicocele of the broad ligament is, however, probably not as uncommon as is supposed. There are but few operators of long and extensive experience who do not come accidentally across cases of this kind in their abdominal and gynecological work; yet we find the literature upon this subject exceedingly meager. The first case reported in this country was that of Dr. Dwight, of Boston, in 1887, quoted by A. P. Dudley, who, so far as Zinke is able to determine, wrote first in this country exhaustively on varicocele in the female, and reported 4 cases.

Winckel found dilatation of the uteroövarian veins not less than 10 times out of 300 autopsies. He also found thrombi. Both Kolb and Bandl have found phleboliths (Pozzi). Dudley also quotes Brandt as having often seen stones the size of peas in the veins of the broad ligament. Rousan states that pelvic varicocele is of frequent occurrence. Edward Malins, of Birmingham, writes interestingly upon "Varicose Veins of the Broad Ligaments," and reports 2 cases. To this Zinke adds 2 cases—one an aneurysmal varix of the right, and the other a phlebolith within the left, broad ligament. In the former case an abdominal section was successfully performed for the relief of uterine hemorrhage induced by varicose conditions in the right broad ligament. This condition was in turn brought on by previous labors and was aggravated by a laterally flexed uterus in the fourth month of gestation.

In the second case a bilateral salpingo-oöphorectomy and myomectomy resulted in the discovery of a phlebolith 4.5 cm. long, 1 cm. thick in the center, and tapering off toward each end, in the left broad ligament quite close to the uterus.

The causes of varicocele and aneurysmal varix of the broad ligament are, to say the least, quite obscure. Dudley in this country, Malins in England, and Winckel in Germany are about the only authors who have essayed the etiological factors of this affection. Dudley divides the causes into (a) constitutional and (b) mechanical; Malins into (a) general and (b) local.

(a) Constitutional or general causes embrace (a) arrest of involution of the uterine and ovarian vessels, keeping up pelvic engorgement long after confinement; (b) a relaxed condition of the tissues from a low state of general health; (c) an unhealthy condition of the vessel walls; (d) an absence of valves in the veins.

(b) Mechanical or local causes embrace (a) the anatomical relations of the veins themselves; (b) the spermatic and ovarian vessels being of such great length that the weight of such a column of blood has a tendency to weaken the vessels; (c) habitual constipation; and (d) uterine displacement or other mechanical causes.

As a reason why the left broad ligament is the more frequently affected Dudley states: The emptying of the venous blood from the left broad ligament into the left renal vein is at right angles to the blood current from the kidney, and it obstructs the free flow of the blood from the ligament into the general circulation.

Janni asserts that varicocele is not due to the retrogressive changes of the venous walls, conditional upon their expansion, but frequently to the neoplasms of the elastic connective tissue of the intima, which assumes the form of an actual endophlebitis in knots or plaques, and is often accompanied by neoplasms of the connective tissue of the median vein.

Zinke thinks correctly that intraabdominal pressure from any cause should be added to the list, and that for the formation of an aneurysmal varix in this region direct or indirect traumatism is necessary, as, for instance, external violence, frequent application of the forceps during labor, repeated abortion, operations upon the cervix, and diseases of pelvic organs.

Another source of superimposed pressure is that from intestinal displacements, which by angulation of the mesenteric veins materially interfere with the visceral circulation.

Symptoms and Diagnosis of Pelvic Varicocele and Aneurysmal Varix.—The most prominent symptom is pelvic pain. It is ordinarily referred to the affected side, but, as the condition is generally bilateral, the pain is usually referred to the entire pelvis. It is of a heavy, dull, aching character, most marked and much increased when the subject remains long in the erect posture, and correspondingly lessened, and even followed by almost complete relief, when she is in the recumbent position for a long time. There may be a history of traumatism, malaise, nervousness, general indisposition, and even of melancholia. Frequent and profuse menstruation or even metrorrhagia in women past the menopause may be observed (Zinke).

The diagnosis of varicocele must of necessity be very difficult and uncertain, if at all possible, even in well-marked cases. Varicosities and vein stones are, as a rule, recognized only when the abdomen is opened on account of other pathologic processes. The same may be said of aneurysmal varix when not very large; otherwise it may give rise, as in Zinke's case, not only to a palpable, pulsating tumor, but to serious hemorrhages from the uterus, especially when complicated with pregnancy. Under certain favorable conditions, however, a diagnosis does not seem impossible in connection with the symptoms given. When limited to the broad ligament and free from thrombi the knotted swelling felt with the patient in the upright posture will be absent when the patient lies down, and only a doughy, thickened condition will present itself to the finger in the vagina or rectum. If thrombi are present the knotted condition will continue to exist more or less. At all events we must never be too sure of our diagnosis.

Treatment of (a) Pelvic Varicocele and (b) Aneurysmal Varix.—MEDICAL.—As the diagnosis is but rarely made before surgical exploration, ordinarily undertaken for other purposes, treatment, either medical or surgical, is but rarely, if ever, addressed to the actual condition. Rest in the recumbent posture, laxatives, or, still better, intestinal lubricants, and vaginal tampons are helpful in ameliorating the pelvic distress present in these conditions. Malins advised hot water irrigations to relieve the always associated congestion and a Hodge pessary for support. All these measures must, however, be looked upon as merely palliative, while that by pessaries must be recognized as a possible source of aggravation to the trouble.

SURGICAL.—This is the only means of cure in these cases. Dudley (A. P.) ligated on either side of the varicosed area and excised the intervening structure. I have never had occasion to operate for this condition by itself, but, when finding it in a good many cases in the course of operations for other purposes, I have disposed of it as follows:

174. PROCEDURE FOR (a) PELVIC VARICOCELE AND (b) ANEURYSMAL VARIX

(1) The abdomen being freely opened, with the patient in the Trendelenburg position, the uterus and broad ligaments are brought into the field of operation.

(2) With a Dechamp ligature carrier, the finger of the other hand acting as a guide, a ligature of slowly absorbing material is passed through the upper margin of the broad ligament below the ovarian artery near the pelvic wall and made to embrace all the veins of the pampiniform plexus.

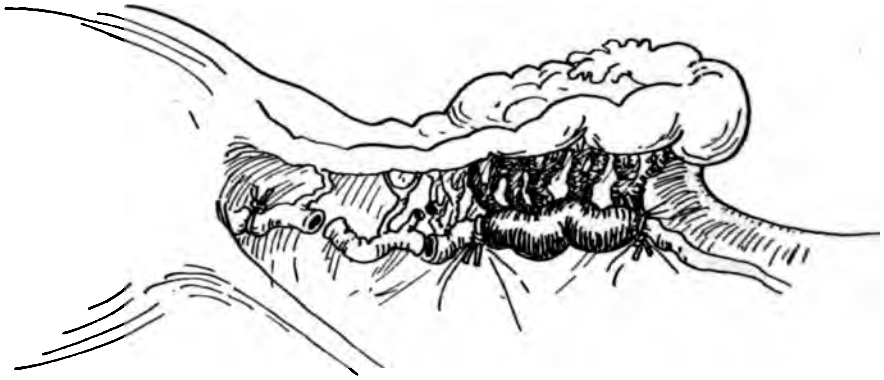


FIG. 358.—(174) PROCEDURE FOR VARICOSE VEINS OF THE BROAD LIGAMENT. Several ligatures have been put in, and the veins cut between two of them. The dark vein shows the engorgement before the veins are cut.

(3) Another suture is similarly passed within 1 cm. of the uterine wall.

(4) A third suture is similarly passed midway between the first two.

(5) All the veins are freely cut across midway between the ligatures (Fig. 358).

The excision of the veins is essential, first to secure their collapse, and next to prevent their restoration after absorption of the ligatures.

HEMORRHOIDS

"Hemorrhoids" is a name applied to varicose conditions of the hemorrhoidal plexus of veins surrounding the lower zone of the rectum.

These varicosities have a varying pathology. In certain acute cases they are mere dilatations of the vessels; in other cases the walls of the vessels break down, occasioning extravasations of blood into the cellular tissues; in others the stasis within the veins results in the formation of intravenous clots or true phleboliths; in still others the permanently dilated veins are associated with hyperplasia of the surrounding connective tissue, forming true hemorrhoidal tumors. These tumors are prone to form (a) at or just within the sphincter ani muscle (*internal piles*), although (b) they are frequently met with outside the sphincter (*external piles*).

(a) There are two varieties of internal hemorrhoids: *capillary* and *venous.* The former are supplied principally by the superficial vessels of the mucous membrane, and the latter by the veins of the mucous and submucous tissues. Capillary piles are broad flat tumors that bleed readily and look very much like strawberries. Venous piles are of frequent occurrence and are composed of dilated veins. They may be small, may remain within the bowel, and bleed freely, or they may be large and protruding, and may bleed occasionally.

(b) There are two kinds of external piles; when composed of hypertrophied folds of skin they are called *cutaneous,* when filled with a firm dark clot *thrombotic.* The former are usually chronic and are the color of the skin; the latter come on suddenly, have a bluish tint, and look like a bullet beneath the skin.

Hemorrhoids, whether external or internal, are caused by various influences. The anatomy of the parts favors the condition. The larger rectal veins pass through the rectal wall by means of little slits. Verneuil believes the return flow of venous blood is impeded by the contraction of the muscular fibers around them, and for this reason he thinks that these little buttonholes are an important factor in the causation of hemorrhoids. Gant believes this to be in a measure true, but there are other factors that play a much more important part; because of gravitation and the fact that the rectal veins have no valves the erect posture assumed by man has a great deal to do in the production of enlarged veins.

The feces, by the time they reach the rectum, are solid, and frequently cause venous obstruction. Certain obstructive diseases of the heart and liver, a retroverted uterus, stricture of the rectum or urethra, chronic diarrhea, overpurgation, stone in the bladder, or anything that presses upon the veins are causes; frequent and prolonged straining will, sooner or later, produce hemorrhoids. Many cases can be traced directly to irregularities in living. In fact, anything that forces an abnormal amount of blood into the rectum or interferes with its return therefrom may be regarded as a cause.

Symptoms and Diagnosis of Hemorrhoids.—Acute hemorrhoids, when internal, produce a sensation of fulness about the anus. When inflamed a smarting is felt; and when not relieved the sphincter becomes irritable, and the suffering is materially increased by its frequent contraction. Often there is constant tenesmus, and the straining sometimes forces internal piles downward until they protrude. The constriction of the sphincter then at times becomes so great that the tumor ruptures and more or less hemorrhage results. Gant summarizes the more prominent symptoms, according to the kind, duration, and violence of the attack, as follows: (1) Protrusion all or a part of the time; (2) bleeding, varying from a few drops to a profuse hemorrhage; (3) a sensation in the rectum as if there was something in the bowel that ought to come away; (4) pain, intermittent and slight, or excruciating and constant, according to the amount of inflammation, ulceration, and strangulation; (5) spasmodic contraction of the anal sphincters; (6) extreme nervousness and loss of flesh; (7) when piles are ulcerated there is more or less pruritus caused by the discharge; (8) when strangulation continues for several days it causes constipation and a slight rise of the temperature.

Treatment.—The treatment of hemorrhoids may be either (a) medical or (b) surgical.

MEDICAL.—The treatment of hemorrhoids by medicinal and hygienic measures is available in acute cases. Rest in the recumbent posture, rectal irrigation with cold water, ice packs to the anal region, and mild laxatives are the most available remedies. Anodynes may be required temporarily to control pain, but they should not be long continued, as they induce constipation and aggravate the condition. Suppositories of opium and belladonna have a tendency to relieve both the local irritation and the sphincteric spasm. The same line of treatment is available in chronic cases in which the varicosities have become permanent, in which tumor formation has taken place, but in which acute inflammation has developed. It should be understood that in these cases the medical treatment is applied only with the expectation that it will overcome the acute recrudescence.

SURGICAL.—Surgical treatment is addressed to the permanent cure of hemorrhoidal tumors. Attempts have been made to establish the practice of removing these growths by caustics and astringent injections. To burn away a pile tumor by strong acids is to subject the patient to prolonged and unnecessary agony, and to the danger of violent and even fatal hemorrhage. The treatment by injection of astringents or destructive agents is both hazardous and inefficient. The methods most generally adopted are those by (a) the ligature and (b) the cautery. Since 1895 I have used almost exclusively a combination of these two, viz.: (c) the combined ligature and cautery operation. A fourth class of operations may be designated as those by (d) excision. The operation that I employ is as follows:

175. PROCEDURE FOR REMOVAL OF HEMORRHOIDS BY LIGATURE AND CAUTERY

(1) Seize the hemorrhoidal tumor with bullet forceps and draw it down until its base is defined.

(2) Incise the skin and mucous membrane entirely around the base of the tumor.

(3) Transfix the base of the tumor with a divisible strand of slowly absorbing animal suture and tie tightly both ways, bringing the pressure to bear in the incised zone (Fig. 359).

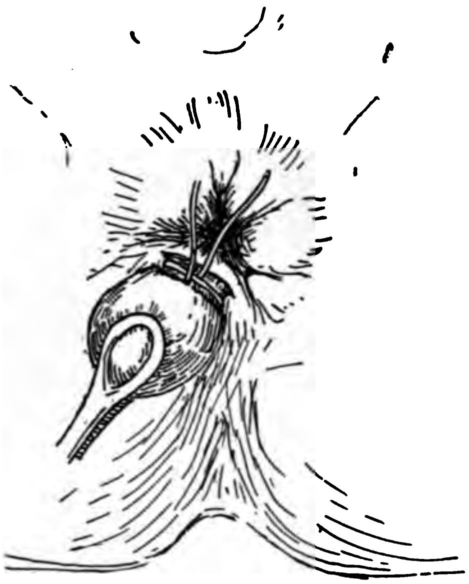


FIG. 359.—(175) PROCEDURE FOR EXTIRPATION OF HEMORRHOIDAL TUMORS BY COMBINED LIGATURE AND CAUTERY METHOD. (a) The tumor is drawn down, the skin and mucosa at its base incised, and the pedicle transfixed with a Staffordshire ligature.

(4) Remove the forceps from the tumor.

(5) Seize both ends of the ligature with a hemostatic forceps close up to the knot.

(6) Wrap a piece of wet gauze about the base of the tumor and under the point of the forceps.

(7) With a thermocautery burn a large crater in the apex of the tumor (Fig. 360), care being taken to avoid burning the ligature.

(8) The other tumors are treated in the same way.

(4) The parts are copiously anointed with vaselin and the patient is put to bed with an ice pack to the anus.

Aside from keeping the parts clean, this operation requires practically no after-attention. It occasions the very minimum of discomfort. The ligature, a guaranty against hemorrhage, comes away without assistance. The cautery insures the destruction of the vein and an aseptic wound following the operation.

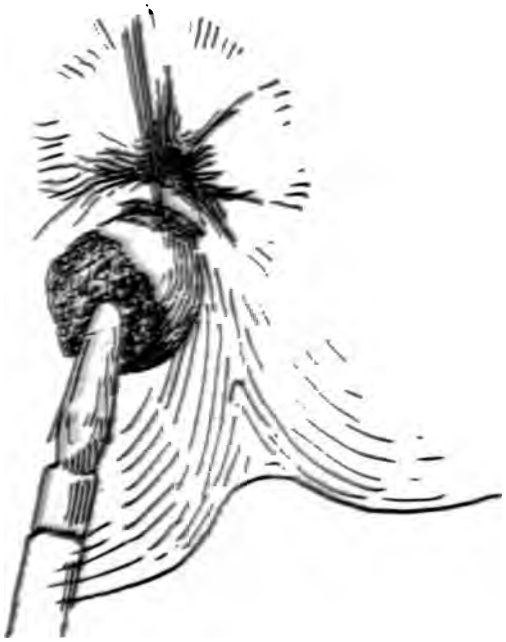


Fig. 390.—(175) Procedure for Extirpation of Hemorrhoidal Tumors by Combined Ligature and Cautery Method. (5) After the ligature is tied a crater is burned into the apex of the tumor deep enough to destroy the blood vessels.

176. TUTTLE CLAMP AND CAUTERY PROCEDURE FOR HEMORRHOIDS

(1) The sphincter is divulsed to the point of temporary paralysis.

(2) The highest point of each hemorrhoidal tumor is grasped and drawn down.

(3) The mucocutaneous margin is incised for 1 cm. with scissors, the points of which are pushed beneath the skin and spread, thus separating the skin from the hemorrhoids.

(4) The hemorrhoids are now clamped (Fig. 361) on a line radiating from the center outward and embracing the vein and as much of the mucosa as it is intended to remove, care being taken not to include the skin.

(5) The hemorrhoidal tumor is cut away with scissors close to the clamp.

(6) The stump is carefully seared with the thermocautery.

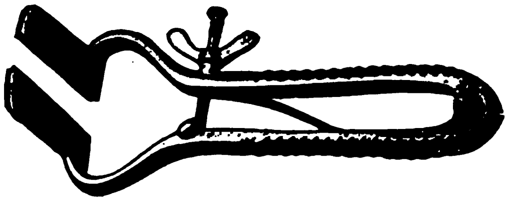


FIG. 361.—(176) PROCEDURE FOR EXTIRPATION OF HEMORRHOIDS BY THE CLAMP AND CAUTERY. (a) Gant's clamp.

(7) The clamp is then removed and each remaining tumor is similarly treated.

The safest guarantee against hemorrhage following this operation is persistent application of the cautery until the pedicle within the clamp is fairly hardened. Matthews says: "I use this plan (clamp

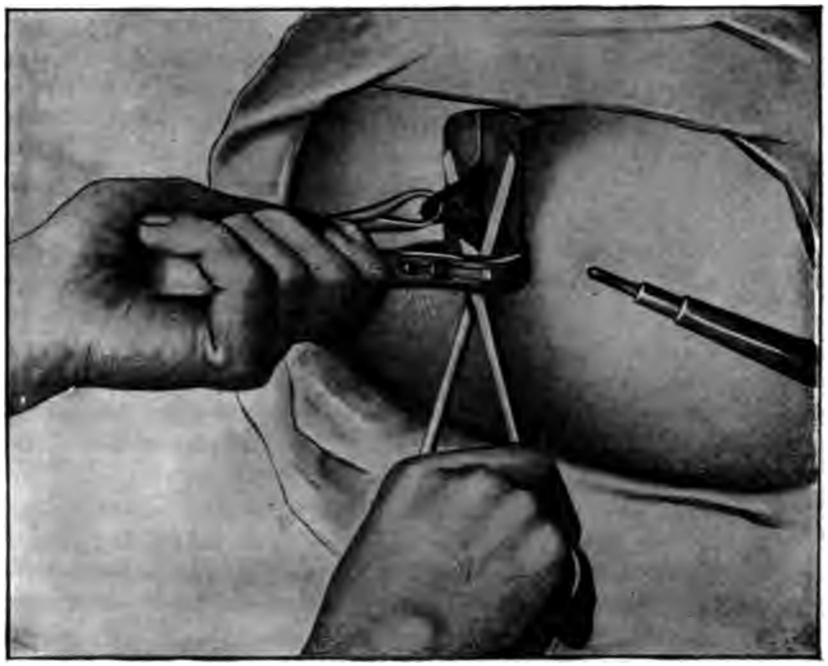


FIG. 362.—(176) PROCEDURE FOR EXTIRPATION OF HEMORRHOIDS BY THE CLAMP AND CAUTERY. (b) Method of cutting off hemorrhoidal mass preparatory to the application of the cautery.

and cautery) in selected cases, viz., where there is a large amount skin around the anus, which is embraced in or goes to make up a p of the internal hemorrhoid. If this amount of skin is cut off exc sive bleeding may occur. If an incision is made around it and it ligated we are chary about cutting too close to the ligature, and, the fore, we have much skin left and many ligatures" (Fig. 362).

177. WHITEHEAD PROCEDURE FOR EXCISION OF HEMORRHOID ZONE

(1) Divulse the sphincter ani muscle.

(2) Seize the hemorrhoidal tumors with bullet forceps and dr them down to or below the anal margin.

(3) Make a circular incision through the mucous membrane a lit above its junction with the skin.

(4) The pile-bearing zone of the mucous membrane is dissect free about 1 cm. beyond the area of venous dilatation and above t sphincter.

(5) The mucous membrane with the hemorrhoidal tumors is a putated at the upper margin of the pile-bearing area.

(6) Control hemorrhage by torsion of the vessels.

(7) The upper flap (1 cm.) of mucous membrane is drawn do and fixed by interrupted suture to the margin of the lower flap mucous membrane.

Some authors describe the discission in this operation as being ma at or external to the mucocutaneous juncture. This is erroneous a is responsible for the cicatricial constrictions that sometimes follo the procedure. If this precaution is observed the papillary area of t skin is not removed and the normal anal reflexes are not disturbed.

178. RICKETTS PROCEDURE OF SUBCUTANEOUS LIGATION FO HEMORRHOIDS

(1) Draw the tumor down with forceps until its base is well define

(2) Pass a sharply curved needle loaded with slowly absorbing a mal suture just beneath the mucous membrane, encircling one-half the base of the tumor.

(3) Reintroduce the same needle at the point of exit, encircle t other side of the base, and bring the needle out at the point of origin entrance.

(4) Tie the ligature very tightly. If necessary nick the membra sufficiently to enable the knot to be tied beneath the surface.

SECTION VII

TROPHIC CHANGES

Trophic changes consist in either a diminution (atrophy) or an increase (hypertrophy) of otherwise normal tissue elements. They are, therefore, to be distinguished from neoplasms, which are new growths.

Atrophy of any of the genitourinary structures of women generally occurs as a late result of inflammation induced by some of the infections. It might, therefore, be considered in connection with the infections. In some instances, however, the atrophy occurs in connection with involutional changes, while in others it is the result of trophic nerve disturbance. It follows, therefore, that these phenomena may be considered as a congeries having more or less common points in pathology.

These atrophic changes occur in connection with the (a) vulva, (b) vagina, (c) the uterus, (d) the adnexa, (e) the bladder.

CHAPTER I

ATROPHY OF THE VULVA

Atrophy of the vulva, as ordinarily encountered, is a senile condition, and occurs as an incident of the usual involutional changes following the menopause. The fat disappears, the epithelium becomes thin and glistening, and the labia lose much of their normal redundancy. In many instances fusion takes place between the proximal surfaces of the labia majora and the labia minora. The same change is often noticeable between the prepuce and the clitoris.

The condition may be quite symptomless. In certain cases it is associated with itching that may be very annoying. It is seldom painful, unless an accumulation of secretion takes place between certain fused areas. Then tumefaction and tenderness occur at the point of accumulation.

Treatment of ordinary involutional atrophy of the vulva is but rarely called for. When accumulations take place in fused areas they should be separated and the secretions liberated.

PROGRESSIVE CUTANEOUS ATROPHY OF THE VULVA

(*Kraurosis Vulvæ*)

This condition is a distinct pathologic and clinical entity and should not be confused with the involutional atrophy just described. It has become generally known as kraurosis vulvæ. This name was given to the affection by Breisky, using the Greek name κραῦρος, parched, hence withered.

The atrophy is strictly limited to the skin and to the subcutaneous tissue, involving the labia majora, the fourchette, and sometimes the perineum. I have never been able to observe either clinically or microscopically the extension of this disease to the mucous membrane of the ostium vaginæ, and believe that this affection is essentially restricted to the vulvar integument. For this reason I have given the disease the more appropriate name of progressive cutaneous atrophy of the vulva.

The first description of this disease is due to Robert F. Weir, of New York, who in 1875 described this affection as an ichthyosis vulvæ. Although he believed that he was describing a case of ichthyosis, yet the symptoms have such an analogy with those of this affection that there is no doubt that he described a case of kraurosis. The knowledge of this disease is really due to Breisky, of Prague. In 1885 he reported twelve cases, with a careful study of the symptomatology and of the pathologic alterations. Possibly such cases had come to the attention of the gynecologist before that time, but the condition had not been pointed out as a pathologic entity. Since the publication of Breisky the subject has been brought to the attention of the Obstetrical and Gynecological Society of Berlin, where, after a full consideration, the disease in question was recognized as a morbid entity.

The first changes perceptible to the naked eye are small reddish areas around the ostium vaginæ; they are not elevated; on the contrary, they are somewhat depressed. They are painful to the touch, and sexual intercourse is painful and futile. The vaginal orifice is very narrow, and there is a diminished elasticity of the tissues. The skin and the mucous membrane have at this point lost a great deal of their pigment, and have become thin and translucent, tense and glossy, so as to have lost all the normal folds of the vulva. The ostium vaginæ is very narrow. The shrinkage is one of the leading features of this disease, but it is manifested not over the whole region, but in different areas. From these centers the process gradually extends until the vulva has been entirely involved. The labia minora are fused together with the labia majora, and scarcely a trace of them is to be seen (Fig. 363).

In some cases the mons veneris is also found in an atrophic condition, associated with complete alopecia.

According to the observations of Breisky, in none of his cases had there existed symptoms of inflammation or of exanthematous affection in the external genitals. In some of his patients an unbearable itching sensation was present. Some of the women were pregnant, and the itching sensation spontaneously disappeared at the end of the gestation. In one of the gynecological cases the woman suffered with an itching sensation which lasted only a few weeks. In two private cases he found one patient who had been afflicted with pruritus for several years, the affection being most annoying at night; she also had leukorrhea and menorrhagia. In another case the pruritus had been present for nearly three years, with relapses at the time of the menstruation lasting from two to three days.

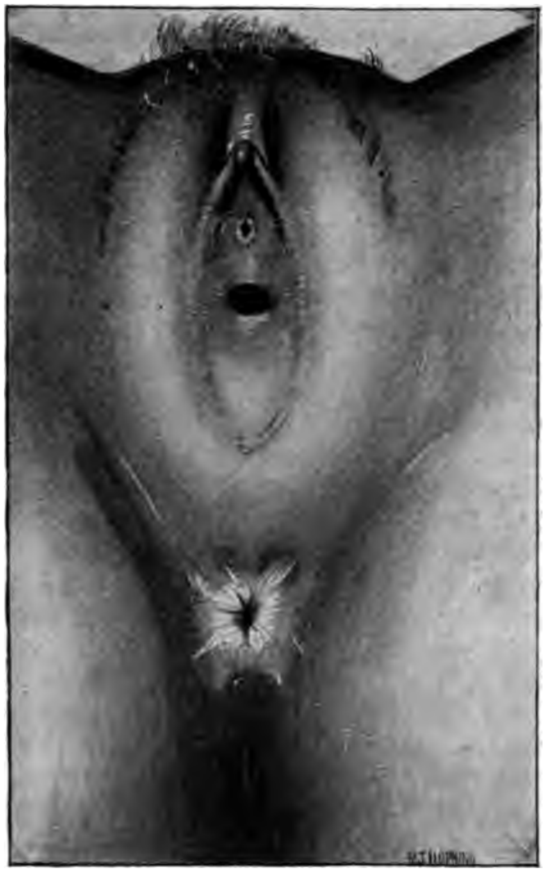


FIG. 363.—PROGRESSIVE CUTANEOUS ATROPHY OF THE VULVA. The labia minora are fused together with the labia majora and scarcely a trace of them is to be seen.

Breisky drew his conclusions from the consideration of all his cases as follows: That chronic vaginal catarrh was present in 4 cases; that in 2 cases scars were present from progressed scrofulous abscesses of the cervical glands; not one had suffered with syphilis; 1 was sterile, 2 were multiparæ, 5 had given birth to one or more children. Not one of the multiparæ had had trouble with her delivery, and in no one had there been an inflammatory process of the external genitals. Although Breisky was of the opinion that this disease was the result of a chronic eczema, yet he never could find this affection in his cases. In the same way the pruritus seems to be one of the principal causes of this disease, and yet only in 3 of his cases was it present.

Indeed, the etiology of this disease is very obscure. It occurs without previous existence of other diseases of the skin of the vulva. In the cases reported by Orthmann no sugar could be found in the urine and there was no history of syphilis. In one of the cases reported by myself there was a history of progressed syphilis in early life, but no later manifestations could be found. So that it has been established and confirmed by Lewin that the atrophy of the vulva is not of a syphilitic origin. Gonorrhea and specific chronic catarrh are considered by some observers as probable etiological factors. This disease is found only in women over forty, which would identify this atrophy with trophic changes induced by advancing age. Olshausen lays a great deal of stress on the extirpation of the uterine appendages as a cause of this atrophy, which relation was found in one of my cases. In one of Jevonsky's cases the affection had started from a cicatrix in a lacerated perineum. From the multiplicity of the possible causes held to be factors in this disease it seems that no one must be considered as such, and Reed prefers the theory that the peripheral trophic nerves or their ganglia are to be considered as the origin of this disease.

Studies of my cases by H. W. Bettman showed a marked hyperemia, which in some places assumed the character of true hemorrhage. The epidermis showed great changes according to the different places; in some points it was hardened, thickened, and hypertrophic; in other places thin and atrophic, and in other places had nearly disappeared. The corium showed two different conditions. One was due to the exudation and infiltration of round inflammatory cells into the stroma of the corium, and the other was due to the sclerosis and atrophy of the tissues. These were two different conditions, one the consequence of the other, and due to the changes of the process. In the first condition the papillæ were infiltrated, in the second they were shrunken and had nearly disappeared. In the same case the different sections show a difference in the pathologic alterations. From the above observations it is plain that the anatomic lesions are of a different character, according to the stage of the disease. In the beginning the hyperemia and exudation predominate in the tissues, later the lesions consist of a thickening and shrinking of the tissues in sclerosis.

Symptoms and Diagnosis.—The subjective symptoms of this disease consist at first of painful points and a painful inelasticity, which are impediments to the copulative act. In the later period there is a loss of sensation in the entire diseased area. Itching is not a constant symptom, and in most of the cases is absent. In 35 cases referred to by

Ohmann-Dumesnil 13 cases were troubled with itching in various degrees. In 5 cases referred to by Orthmann only 1 patient complained of an itching sensation. In 11 cases of my own 3 only were annoyed in that way, and that only at the beginning of the affection.

The diagnosis is often made as vaginismus in the beginning of the affection, but careful inspection will reveal the sensitive areas at the ostium vaginæ and the already begun shrinkage of the vulvar integument. When the areas of atrophy have begun it is possible to mistake the disease for ichthyosis, but in this disease there are adherent scales, which are never found in kraurosis.

In reference to the prognosis Tait says that the patient should always be informed that the progress of the disease will extend over years, that it will certainly get well in time, but that treatment from time to time will give relief. It seems that the recovery alluded to is nothing else than the disappearance of the subjective symptoms. We can not promise recovery to the patient affected with this disease under any circumstances.

Treatment.—The treatment may be divided into palliative and curative. The first is obtained by remedies to relieve pain. Carbolic acid in the form of a lotion, on account of its anesthetic quality, affords some temporary relief. Tait recommends the application between the small labia at bedtime of a piece of cotton dipped in a solution of neutral acetate of lead in glycerin as capable of giving relief. A mixture of tannin and salicylic acid in glycerin has been used in the same way with good results. Tait condemns cocain as useless and irritating. The application of nitrate of silver in stick to cauterize the degenerated patches, so as to obtain a good cicatricial tissue, diminishes the sufferings, but does not arrest the progress of the disease. Heitzmann tried to scrape off with a sharp curette the hard tissues involved, but the length of time this process takes and the poor results it gives do not commend it. The general tonic treatment must be strongly enforced so as to improve the general condition of the patient.

As a curative treatment I practice excision. First, the mucous membrane of this locality is completely excised in the form of an ellipse, and the denuded edges are then brought together by means of interrupted sutures. A patient upon whom I used this procedure had some temporary relief, but seven months after the disease appeared on the integument. Martin, as reported by Orthmann, has begun the method of a complete excision, which must be applied according to the parts affected, removing the tissue thoroughly and approximating the edges. In this way eight cases operated upon by Martin completely recovered. The same operation in my hands has given very good results. It is necessary not to operate in the beginning of the affection, because the process is not yet limited, and it is liable to spread in spite of the operation. But, when the operation is performed at the time that the sclerotic process is limited, then there is no danger of a recurrence of the disease.

179. PROCEDURE FOR EXTIRPATION OF ATROPHIC AREA IN PROGRESSIVE CUTANEOUS ATROPHY OF THE VULVA

(1) An incision is made around the outer margin of the atrophic area.

(2) Another incision is made similarly around the inner margin of the atrophic area.

(3) All structures lying between these two lines of incision are excised down to the normal connective tissue. This excision may or may not involve the clitoris (Procedure of Clitoridectomy).

(4) The outer cutaneous margins are then lifted up by tissue forceps and dissected away from the underlying connective tissue for the depth of about 0.5 cm.

(5) The outer margins and the inner margins of the wound are then approximated by interrupted sutures.

CHAPTER II

ATROPHY OF THE VAGINA

Atrophy of the vagina occurs as an involutional change following the menopause.

It is characterized by a great diminution of the epithelium, a lessening in the size and volume of the muscularis, a shrinkage of the surrounding cellular tissue, and disappearance of the normal rugæ of the canal. This latter change occurs largely as the result of fusion of the proximal surfaces. The process is especially manifest in each fornix of the vagina, both of which in many cases are entirely obliterated by fusion.

This change causes practically a reversal of the vaginal pyramid. In early life, or during sexual activity, the vagina is a reverse pyramid, with the axis at the ostium; after the changes alluded to have occurred it is a pyramid with the base at the outlet.

In some instances the fusions cause "bridges" to form; in others stenosis with retention of secretions are among the results.

Symptoms and Diagnosis.—The condition may be symptomless in its early stages. Later it occasions discomfort expressed by a drawing sensation. There is generally some leukorrheal discharge. If marital relations are sustained there may be light hemorrhage following intercourse. Discharges kept back by fusions speedily become offensive. Diagnosis is readily made by digital examination. If the possible existence of this condition is kept in mind it will be readily distinguished from either carcinoma or tuberculosis of the vagina.

Treatment.—Involutional atrophy of the vagina is a physiologic process, and, when uncomplicated, does not call for treatment. When, however, fusions occur they should be broken up, and the vagina irrigated and kept distended by tampons until the raw surfaces are healed.

CHAPTER III

ATROPHY OF THE UTERUS

Atrophv of the uterus may occur as:

- (a) A hyperinvolution following delivery.
- (b) A final condition of parenchymatous metritis.
- (c) A senile involution.

In occasional instances hyperinvolution following an apparently normal delivery may reduce the uterus to almost infantile dimensions. Parenchymatous metritis, without reference to the dominant bacterial factor in the infection, is sometimes followed by a similar shrinkage of the muscularis, and later by diminution of the epithelium of the endometrium. Similar shrinkage has been noted in occasional instances following curettage. I have had three cases of this kind that I can now recall.

The structural changes are not materially different from those that occur physiologically at the menopause, with the exception that numerous connective tissue bands are found interspersed throughout the muscularis. These exercise a constrictive influence upon the cellular elements, causing their destruction or absorption (see Menopause).

ARTERIOSCLEROSIS OF THE UTERUS

Arteriosclerosis of the uterus consists of a hardening and loss of elasticity of the walls of the arteries and arterioles located in the uterus. The condition is not to be confused with that of atheroma, which, so far as available records indicate, does not occur in the arteries of the uterus. The condition was first defined by Scanzoni, and later by Rokitansky and Leopold. Interesting reports on the subject have been made by Pearse, Rees, Watkins, Simpson.

The uterus that is the seat of arteriosclerosis is generally pale in appearance and resistant on section. Arteries distributed throughout the parenchyma, both corporeal and cervical, are generally visible to the naked eye. They appear as tubes with thick white walls. When cut across the lumen is generally found to be relatively small. Occasional thromboses are found in the uterine sinuses. Waterhouse speaks of the middle coats being converted into a wavy hyalin membrane, containing here and there a few connective tissue nuclei, and of irregular thickenings of the intima encroaching upon the lumen. The change in the middle coat is equally pronounced, and in many of the vessels no muscle fibers remain. These conditions are responsible for the thickening and inelasticity of the vessels.

Symptoms and Diagnosis.—The essential symptom of this condition is hemorrhage. This may occur as both menorrhagia and metrorrhagia. The flow may occur with or without pain. It may vary from a mere dribble to a copious hemorrhage. Solowij and Rees have reported fatalities due to hemorrhage from this cause.

The diagnosis is arrived at only by exclusion. Chronic granular endometritis, malignant neoplasm of the body of the uterus, diffuse fibrosis, submucous myomata, and polypoid growths are to be taken into consideration. Diagnostic curettage should be practiced and the scrapings carefully examined. The arterial sclerosis may not, and probably cannot, be revealed by this means, but the presence or absence of adventitious growths can ordinarily be determined from the scrapings. If not, surgical exploration of the interior of the uterus may be practiced. This is done either by forcible dilatation of the cervix or by incision of the cervix, and digital exploration. The occurrence of persistent hemorrhage not otherwise explainable in women between 40 and 50 raises a presumption of arteriosclerosis.

Treatment.—MEDICAL.—The patient should be given absolute rest. Coal-tar preparations in small doses may be given to lessen the arterial tension. Ergot may be given as an oxytocic. Calcium lactate is recognized as a remedy for this condition. Forchheimer advises sodium iodid, beginning with small doses of 5 grains and running up to 15 grains three times daily. He occasionally gives an iodized form of nuclein.

In all cases of confirmed arteriosclerosis medical treatment can be relied upon only at the hazard of a possibly fatal hemorrhage.

SURGICAL.—In the presence of a violent attack the uterus must be promptly and forcibly packed with a tampon saturated either with pure carbolic acid, c. p. acetic acid diluted 50 per cent., ferric bichlorid, or adrenalin, 1-1,000.

After the cessation of the flow the uterus may with advantage be curetted and again packed, with or without styptics.

The only radical cure is by removal of the uterus, which alone offers any security to the patient. This ought to be done before sclerosis in the adnexal arteries has so far advanced as to establish danger from secondary hemorrhage following operation.

For ***atrophy of the ovaries*** see Chronic Ovaritis.

SECTION VIII

SURGICAL CONDITIONS OF PREGNANCY AND PARTURITION

The gynecologic surgeon is frequently called upon to operate for certain surgical conditions arising in connection with pregnancy and parturition. Chief among these conditions are:

(a) Conditions demanding the emptying of the pregnant uterus.
(b) Ectopic pregnancy.
(c) Spontaneous rupture of the uterus.
(d) Parturient rupture of the uterus.
(e) Laceration of the cervix and perineum.
(f) Dystocia demanding (a) symphysiotomy, (b) pubectomy, (c) Cesarean section, and (d) celiohysterectomy, or Porro operation.

CHAPTER I

EVACUATION OF THE PREGNANT UTERUS

It is sometimes imperatively necessary to empty the pregnant uterus before the period of viability for the purpose of saving the life of the mother. Such conditions as the pernicious vomiting of pregnancy, infection of a conception through attempts at criminal abortion, a retroflexed pregnant uterus with fixation in the cul-de-sac, renal insufficiency causing uremia with a tendency to eclampsia, hydatid or other diseases of the ovum, large fibromata of the lower segment of the uterus, intra-uterine growths, or persistent uterine hemorrhage may call for intervention.

It is of the highest importance in interfering with pregnancy that the surgeon shall appreciate the full measure of responsibility, moral, legal, and professional, that he thereby assumes. He may not under any consideration lend himself to the whim of the parents, one or both, who for any reason whatever merely desire to interrupt pregnancy, thus to evade the act and consequences of reproduction. The law throws its protecting influence over the human family by interdicting such practice and imposing severe penalties for its violation. In most states it is, and in all states it ought to be, unlawful for a physician to interrupt a pregnancy for even the legitimate causes that I have enumerated without formal professional consultation with one, in some states more than one, legal practitioner of medicine. In no instance ought the unsupported story of the patient, however plausible, be accepted as an excuse for intercepting pregnancy. Nothing but the objective symptoms, demonstrated to the entire satisfaction of the attendant and his consultants, ought to be accepted. It should be remembered that an agreement between physicians to break up a pregnancy without adequate cause is an additional offense under the law, and that in the event of fatal issue they are liable to answer to the charge not only of criminal abortion, but of criminal conspiracy.

The interruption of pregnancy should always be recognized as a strictly surgical procedure, calling for the exercise of every surgical precaution to prevent unnecessary injury, hemorrhage, or infection.

180. WHITRIDGE WILLIAMS PROCEDURE FOR THE INDUCTION OF ABORTION BY DILATATION AND CURETTAGE

(1) The cervix should be dilated by some such instrument as a Goodell or Hegar dilator, until at least one finger can be introduced into the uterus.

(2) The entire hand, anointed with sterile vaselin, is then introduced into the vagina, and the index finger carried up into the uterine cavity, while the other hand, placed upon the abdomen, forces the uterus downward.

(3) With the finger within the uterus the placenta is separated from its attachments.

(4) The product of conception is removed entire or broken up into small pieces, which can be removed by means of an abortion or ovum forceps.

The attempt to empty the uterus blindly by means of a curette and ovum forceps is discouraged as dangerous. Several cases of perforation of the pregnant uterus by the curette have been reported. I once saw the cervix of a pregnant uterus ruptured by a distinguished operator who was attempting to dilate it with a Goodell dilator. The abdomen was opened immediately, when it was found that a large hematocele had already formed in the broad ligament. A hysterectomy was required to save the patient.

In cases such as the one just mentioned, a woman pregnant for the first time, dilatation as practiced by Williams can not be done. Under such circumstances recourse may be had to the following:

181. PROCEDURE FOR THE INDUCTION OF ABORTION BY THE GAUZE PACK

(1) Dilate the cervical canal slightly without passing the dilator into the uterine cavity.

(2) Pack the cervical canal very tightly with a strip of sterile gauze.

(3) The vagina is firmly tamponed with the same material.

(4) After twenty-four hours remove the pack.

In some cases the ovum will follow the pack; in others both the ovum and the cervical pack will have been expelled into the vagina; while in still others the cervix will have become so dilated as to admit a finger. In some instances it may be necessary to repeat the pack.

It occasionally happens that the uterus must be emptied in a case *in extremis.* This can be accomplished by the

182. PROCEDURE FOR THE INDUCTION OF ABORTION BY INCISION OF THE CERVIX

(1) Draw the uterus down with traction forceps.

(2) Separate the cervix from the bladder.

(3) Split the cervix vertically to a point about 5 cm. above the internal os, but do not enter the peritoneal cavity.

(4) Introduce the finger and break up the connections of the ovum.

(5) Cleanse the uterine cavity with normal salt solution, and pack it with a long ribbon of sterile gauze, one end of which is brought out through the cervical canal.

(6) (a) First the incision in the cervix and then (b) the cervicovesical incision are closed with interrupted chromic catgut sutures.

The intrauterine pack is removed after twenty-four hours, and, if required for drainage, an Outerbridge dilator may be inserted. Usually, however, the drainage is sufficient.

CHAPTER II

ECTOPIC PREGNANCY

An ectopic pregnancy is a misplaced pregnancy. The misplacement may be into either (a) corner of the uterus, (b) the Fallopian tube, (c) the ovary, or (d) the abdominal cavity.

This pathologic condition until recently constituted a dark chapter in gynecological surgery. It was altogether misunderstood in its etiology and pathology, its symptoms were misinterpreted, and hundreds of deaths occurred annually which would now be prevented by timely surgical intervention. Following the possibilities of aseptic surgery this great achievement was accomplished by one man, Lawson Tait, whose genius illumined the entire subject and established methods of cure that approach perfection. The first correct interpretation of the pathology of this abnormality, which has such heavy mortality, was attained by Bernutz and Goupil, two able French observers who made an exhaustive study of the disease by post-mortem examination. The work of these eminent students of pathology was translated into English in 1866, and widely circulated under the auspices of the New Sydenham Society by Alfred Meadows. The work was ably reviewed in America at great length by Parvin, yet no surgeon adopted the true pathology of extrauterine pregnancy as therein set forth. John S. Parry, of Philadelphia, made a valuable contribution to the subject in a book published in 1876, but did not elucidate the pathology or recognize the surgical aspects involved, when, through the advance of aseptic surgery, it became practicable to open the abdomen with safety for the relief of grave and obscure intraabdominal disease. Tait dealt with the subject in a masterly way. Utilizing the post-mortem researches of Bernutz and Goupil and the clinical observations of Parry, he elucidated the entire subject, classified its various types and phases, and formulated and demonstrated with the mind of a genius and the hand of a master therapeutic resources which have placed his name forever among the benefactors of science and humanity.

It is impossible here to go into a discussion of all the alleged causes of tubal pregnancy, since most of them really deserve detailed consideration. Herzog, who has carefully studied the gross and fine anatomy of over 30 cases of tubal pregnancy, believes that in a considerable proportion congenital anomalies of the tubes must be held responsible for the establishment of an ectopic gestation. Herzog has certainly twice, and possibly three times, seen tubal pregnancy in a diverticulum of the main canal, and once in an accessory blind fimbriated extremity. Several times he noticed that the tubal canal in which the pregnancy occurred was unusually tortuous, so that the road from the fimbriated extremity to the ostium internum of the tube, which the ovum would have to transverse, was an unusually long one. The theory that congenital anomalies are the cause of tubal pregnancy is supported by facts.

So far as our exact knowledge goes to-day, we must, however, confess that we are unable in most cases of ectopic gestation definitely to give the exact causes of this occurrence, often so very grave in its consequences. That our knowledge as to the etiology of most cases of ectopic gestation is yet so very deficient lies in the very circumstances surrounding this occurrence. In addition we must not forget that when we obtain a specimen for examination, *post operationem* or *post mortem*, hemorrhages and secondary changes have often so mutilated the parts that exact anatomical studies frequently become utterly impossible.

(a) If the ovum is in the part of the tubal canal which perforates the uterine wall we speak of it as an interstitial pregnancy. This variety is not very frequently seen. There have been reported erroneously as interstitial pregnancies cases which were cornual, or where the ovum was located in a blind prolongation of Gärtner's duct, which sometimes extends down into the cervix. In interstitial tubal pregnancy the developing ovum frequently pushes its way into the uterine cavity, and we then have the condition known as tubouterine gravidity. In it the gestation sac may be of fair thickness, and the pregnancy may go on to full term and terminate fairly normally.

(b) The second variety of tubal pregnancy is present when the ovum is found in the middle part of the tube, in which case we are dealing with an *isthmic tubal pregnancy*, or tubal pregnancy. The placenta in these cases generally has its seat in the lower or posterior part of the tube wall. The gestation sac in this variety is generally very thin and the danger of rupture very great. Here we also sometimes find pedunculated gestation sacs.

(c) Probably the most frequent variety is that of a development of the ovum in the outer third of the tube or ampulla. This kind of ectopic gestation is known as *ampullar pregnancy*. The widest part of the Fallopian tube, the ampulla, naturally offers the most favorable conditions for an undisturbed development of an implanted ovum. So we frequently find ampullar pregnancy develop much beyond the earlier months of gestation.

(d) The funnel-shaped ampulla favors abortion of the ovum. The latter sometimes partly protrudes out of the ampulla into the general peritoneal cavity, and then we have the condition known as *tuboabdominal pregnancy.* This is, however, not the rule, but the exception in ampullar pregnancy, because there exists already in the earlier months a tendency of the fimbriated extremity to become closed by agglutination of the plicæ.

(e) It also occurs that the ovum in ampullar pregnancy protrudes into, and partly develops in, cystic portions of the ovary. This condition can probably supervene only when, early in the course of or prior to ectopic gestation, the fimbriated extremity becomes adherent to the ovary and forms what is called a tuboovarian cyst. The form of ectopic gestation then established is called *tuboövarian pregnancy.* That primary true ovarian pregnancy occurs as a matter of fact is demonstrated by well-authenticated cases, notable among which is an advanced case by Price, in which the child went to term, projecting on either side from the enlarged ovary; and by an early case by Withrow, the fact of impregnation in the latter having been established by careful microscopical studies by Whitacre.

(f) Abdominal and intraligamentous pregnancies are developed from primary tubal gestation. Intraligamentous pregnancy may be brought about in a variety of ways. There may be a rupture of the lower part of the tube wall with more or less hemorrhage and the escape of the ovum between the folds of the broad ligament. The growing ovum may so stretch the lower segment of the tube that it becomes entirely membranaceous, and the sac so formed may unfold the two leaves of the broad ligament. This splitting apart of the layers may also be brought about in such a manner that the ovum completely rarefies the wall of the Fallopian tube at some point, and produces a slit through which it escapes to a spot between the folds of the broad ligament, where further development takes place.

Abdominal pregnancy can be brought about in a variety of ways. An ovum located in the tube may be aborted through the ostium abdominale into the general peritoneal cavity. If its placenta is not too seriously damaged the embryo may, after tubal abortion, go on developing. Rupture of the tube may send the ovum into the general abdominal cavity. The embryo may continue to develop not only when, after primary rupture, its membranes are intact, but even after rupture of the fetal membranes has taken place.

Almost every case terminates in the earlier months of development by rupture or abortion. Rupture, in the majority of cases, is brought about by preceding larger or smaller hemorrhages. The latter are of two kinds: small hemorrhages from enlarged tubal vessels into the edematous and inflamed tube wall, and hemorrhages from the uteroplacental sinuses into the intervillous space. The uteroplacental sinuses in tubal pregnancy are opened in a more irregular and more extensive manner by the syncytium than is the case in normal uterine pregnancy, and the stretching of the tube wall by the enlarging ovum early establishes a tendency to extensive hemorrhages from the uteroplacental sinuses into the intervillous space. These hemorrhages frequently dissect the ovum loose from the gestation sac, and rupture is often initiated in this manner. But, even if a rupture does not occur, the embryo may be killed, and the ovum arrested in further development in consequence of the intervillous or interplacental hemorrhages.

If the development of the embryo in ectopic pregnancy is arrested early in consequence of rupture or abortion, and if the fetus gets into the general peritoneal cavity, it is speedily absorbed, so that after a few days there is no trace left of it. Older embryos, arrested in development, become the subject of either mummification and lithopedian formation or of maceration. The latter process usually takes place if the embryo has been deprived of its protecting fetal membranes. Maceration brings with it the danger of septic infection or putrid changes. The process of calcification of an ectopic ovum may assume one of three forms. If only the fetal membranes become infiltrated with lime salts we speak of a *lithokelyphos;* if the fetal membranes and the superficial tissues of the fetus are incrusted we speak of *lithokelyphopedion,* while *lithopedion* proper signifies the condition when the embryo alone presents as a calcareous mass. Lithopedion formation is not infrequently found after the death of a fully developed fetus has been brought about by spurious labor. A lithopedion may often remain for years in the abdominal cavity without giving rise to trouble, yet may ultimately bring trouble about after having been harmless for a long period of time.

Tubal gestation may be a twin pregnancy, and cases of bilateral tubal pregnancy have been observed. Repeated tubal pregnancies have likewise been recorded.

The uterus in ectopic pregnancy undergoes hypertrophy. The latter is, of course, mostly confined to the muscular coat. The uterine mucous membrane is changed into a decidua. That this is the case was maintained years ago by Langhans and others. There have been those, however, again and again, who assert that there is no uterine decidua formed in tubal pregnancy. Herzog, who has studied uterine scrapings from a number of cases of tubal pregnancy, finds that a decidua is formed. It is not materially different from the decidua vera as formed in normal uterine pregnancy. This decidua is frequently shed at the time of rupture, abortion, or when the embryo dies from any cause. This accounts for the fact that a number of observers, making an examination at an improper time, have not found any uterine decidua and have been misled into the belief that none is formed in tubal pregnancy. The uterus as a whole in ectopic pregnancy enlarges to the size of a womb in the third or fourth month of normal pregnancy. Beyond this stage it rarely, if ever, hypertrophies; it then either remains stationary or frequently even becomes gradually smaller. This is always the case as soon as the embryo is arrested in its development by rupture, abortion, or otherwise.

The histologic phase of ectopic pregnancy has been summarized by Herzog as follows: From observations recently made by Van Heukelom and Peters upon very young human ova obtained *in situ* in the uterus it appears that the human ovum, like that of other mammals, is surrounded soon after fecundation by a layer of solid ectoblast, called "trophoblast." In this many nuclei but no individual cell boundaries are distinguishable. The trophoblast, as it appears, has phagocytic properties and enables the ovum to corrode its way into the uterine mucosa, which at this early time has already assumed the character of the decidua. If this is the normal *modus operandi,* and the observations cited very strongly suggest that it is so, it is easy to understand how an impregnated ovum may implant itself into the tubal mucosa. The mode of implantation would be exactly the same as in the uterus, because it depends chiefly, if not exclusively, upon structures and properties of the fertilized ovum itself. From the trophoblast are later on developed the villi with their two ectodermal layers, viz., the inner cell layer of Langhans and the outer nucleated plasmodium, the syncytium. The very first stages of placental formation have never been observed in ectopic pregnancy.

If we turn to what has been observed the following outlines may be given: The early placenta fœtalis in tubal pregnancy is in no way different from the same structure in normal uterine development of the ovum. The villi possess a mesodermal core with fetal blood vessels and a double ectodermal lining, the cell layer of Langhans and the syncytium. The placenta materna presents a decidua serotina not so well developed as in normal uterine pregnancy, but showing large typical decidual cells and a division into a decidua compacta and a decidua spongiosa. The open spaces in the spongiosa are frequently lined by high columnar epithelium. This may also, however, be more or less flattened, or it may have degenerated entirely and be found to have dropped off into the lumen of the pseudogland spaces. The latter have been formed by the deeper recesses between the original plicæ of the tubal mucous membrane. The changes which the pl undergo in tubal pregnancy consist in a club-shaped thickening an transformation of the fine connective tissue spindle cells into elem of the character of decidual cells. The plical blood vessels bec enormously dilated to form the tuboplacental blood sinuses. Neighl ing plicæ become confluent at their higher parts, and this gives to the formation of the upper compact layer of the decidua, while deeper recesses between the plicæ give rise, as already stated, to pseudogland spaces; forming in this manner the lower spongy laye the decidua. The formation of the decidua vera is similar to tha the serotina, but the vera, as a rule, does not extend very much bey the place of insertion of the ovum. The formation of a decidua flexa, or capsularis, in tubal pregnancy has been denied. Herzog however, reported an instance that is beyond doubt.

The changes going on in the muscularis of the tube consist i hypertrophy of the muscle cells. Microscopic examination of the ge tion sac shows that the bundles of muscle fibers become separated interstices. These are often filled out with fibrous connective tis but frequently we only find an edematous or serous material betw the muscle bundles. The whole tube wall, including the decidua infiltrated with cellular elements of an inflammatory type, such polynuclear leukocytes and lymphocytes; plasma cells are like found. This inflammatory reaction is brought about by coagulat necrosis, in consequence of pressure and pulling and smaller and la apoplectic insults from enormously enlarged tubal vessels.

SYMPTOMS AND DIAGNOSIS OF ECTOPIC PREGNANC

The symptoms of ectopic pregnancy of course vary with its p ress, according to the integrity of the sac, and to whether the fetu living or dead. In the early period the ordinary signs of pregna are to be observed. Among these cessation of menstruation, nau and changes in the breasts are to be mentioned, though any and of these symptoms may be absent, or modified by individual peculiarit As a rule, however, menstruation is delayed or missed, and the pati exhibits sufficient of the classical symptoms of pregnancy to di attention to the probability of such a condition. The recurrence menstruation, which is usually irregular and profuse, is a part of early history of this condition; and the shedding of the decidua in form of shreddy discharges constitutes a valuable diagnostic sympt of the early period.

Careful examination at this time reveals an enlarged uterus w softened cervix simulating normal pregnancy, and with a soft and m able tumor upon one side of the uterus. A microscopic examination of the expelled decidua will often disclose the character of that membrane positively and thereby facilitate diagnosis. Prior to the rupture of the tube the symptoms are obscure and uncertain, and the physical signs are for the most part those of normal pregnancy.

Symptoms arising from the various accidents of ectopic pregnancy have been carefully studied by McMurtry, one of the earliest investigators of the subject, and I have summarized his views as follows:

(a) Rupture, in cases of strictly tubal pregnancy, may be said always to happen by the twelfth or fourteenth week; the symptoms are marked and often most alarming. The pain is sharp and agonizing, and is referred to the pelvis. There is a bloody flow from the uterus at this time. The patient will usually exhibit the symptoms of profound shock and internal hemorrhage. It is not uncommon for the patient to fall to the floor and suffer profound shock, and in a large proportion of cases fatal collapse from pain and hemorrhage will supervene within a few hours. In other cases the symptoms will not be so severe and extreme. The rupture may be only partial and the hemorrhage slight, when the symptoms will be correspondingly light and transient.

(b) After a brief interval, varying from a few hours to several days, the rupture will extend with renewed pain and pronounced symptoms of intraabdominal hemorrhage. Associated with this condition will be general abdominal tenderness, followed later, if left alone, by symptoms of peritonitis. With primary intraperitoneal rupture there is hemorrhage, but the detection of effused blood inside the peritoneum is difficult and uncertain; hence in this condition bimanual examination will avail but little at first in detecting the effusion. Later, when the blood has gravitated and coagulated, the physical signs elicited by bimanual examinations will show the pelvis to be filled with a semisolid mass.

(c) When tubal abortion occurs the symptoms may be of such limited severity as to deceive the patient and physician as to the nature of the illness. The ovum is detached from its bed in the ampullar extremity of the tube, and, with the accumulated blood of successive hemorrhages, forms a mass to become absorbed or to be walled off by adhesions. The general symptoms will be those of a tender, boggy mass and localized peritonitis, readily confounded with other forms of tubal disease.

(d) When rupture occurs with cleavage of the folds of the broad ligament, but without rupture into the general peritoneum, the symptoms are very obscure. The pain is paroxysmal, is prone to recur, and varies as to its severity. The symptoms of collapse are not so severe as when intraperitoneal rupture occurs, due to the limited hemorrhage—

limited because of the resistance of the inclosing layers of the broa ligament.

(e) This latter is the form of ectopic pregnancy which permi continued vitality and development of the fetus. Secondary ruptu takes place later into the peritoneal cavity, and may occur so soon aft primary rupture that they can scarcely be distinguished. Few fetus survive the fourth month, and the symptoms during these months resu from the ruptures of the investing tissues, and the hemorrhages ass ciated inevitably with these changes. After the fourth month, if th fetus survives, the symptoms are those of intrauterine pregnancy wit the modifications which would reasonably obtain under the altere environment of the growing fetus.

When the history and symptoms are considered in conjunction wit careful bimanual examination the diagnosis will, as a rule, be readil established, if, as usually occurs, it has not been made before exan ination is undertaken. Diagnosis during the first week and prior t rupture is rarely practicable, not only on account of the vague an obscure character of the symptoms, but also from the fact that th symptoms are rarely sufficiently active to impel the patient to see medical advice. Menstruation is absent or retarded during this stag and hemorrhage coming on later marks the shedding of the decidu Physical examination is of doubtful significance, as the unruptured tul may be displaced posteriorly or may recede from the examining finger as does a cystic ovary or hydrosalpinx. Under these circumstances th general symptoms of nausea and changes in the breasts and uter will afford those presumptive indications upon which a tentative diag nosis will be made.

(1) When the primary intraperitoneal rupture takes place th symptoms of severe localized pain, varying in degree with the exte of rupture, together with the indubitable signs of intraperitoneal hemo rhage, readily establish the diagnosis. This generally occurs about th seventh week and is usually the first positive symptom that impels th patient to seek advice. Ectopic pregnancy is most frequently observe in women with preëxisting pelvic disease, which fact renders sligh menstrual disturbances of minor significance. A vaginal examinatio at the time of rupture is often negative on account of the presence c pain and muscular contraction. After the paroxysm of pain has passe a mass on one side of the uterus will be apparent to the bimanua touch. The diagnosis, however, is determined more by the distinct in dications of hemorrhage than by the detection of a tumor. General ai dominal tenderness is usually present with the symptoms of shock an collapse.

(2) When the rupture is into the fold of the broad ligament th

pain is more variable as to its severity, and is usually paroxysmal. The shock is correspondingly less marked and the volume of effused blood is limited by the resistance of the peritoneal folds composing the broad ligament. When the rupture occurs into the broad ligament very early in the period of pregnancy the pain and hemorrhage may be very slight and may pass unrecognized, as if the condition was one of ordinary menstrual pain or colic. Such cases often recover entirely without treatment, the ovum, secundines, and effused blood being absorbed. When secondary rupture into the general peritoneal cavity occurs in this form of tubal pregnancy there is a recurrence of pain, with the symptoms of hemorrhage and shock very similar in character and severity to primary intraperitoneal rupture.

(3) If the ovum survives after secondary rupture by retaining sufficient vascular attachment to the tubal mucous membrane for its support an altogether different and more marked series of diagnostic indications makes its appearance, which should be interpreted in the light of the possibly newly developed anatomical relations (Fig. 364). These advanced symptoms are marked after the fourth month and are both general and local. The general diagnostic symptoms are those characteristic of advanced pregnancy, and consist in absence of menstruation, changes in the breasts, vulva, and uterus, abdominal enlargement, movements of the fetus, placental souffle, and ballottement. Palpation of the fetus is easily made on account of the thinness of the abdominal walls. As a means of diagnosis palpation is an untrustworthy resource in ectopic pregnancy, since the same impressions may be derived through the walls of an attenuated uterus. McMurtry has had frequent cases of attenuation of the uterus in which repeated examination by several skilled observers gave the impression, in the face of a doubtful history, of ectopic pregnancy nearing full term. Normal delivery demonstrated the true condition to be that of attenuated uterus.

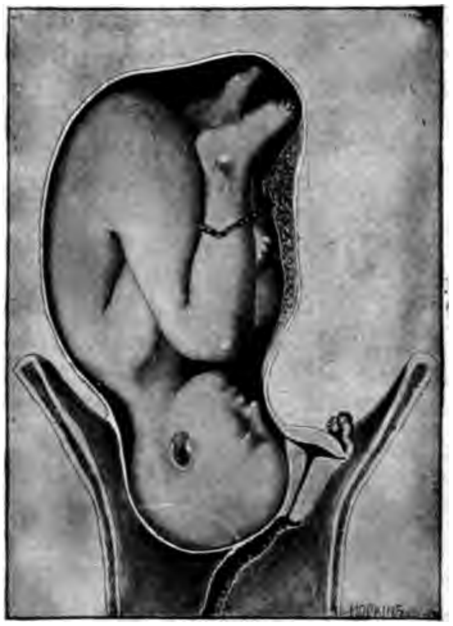


FIG. 364.—NEWLY DEVELOPED ANATOMICAL RELATIONS IN ABDOMINAL PREGNANCY.

In such cases the uterine walls are so thin that the fetal head, body, and limbs may be followed by the hands, as if subcutaneous. In the diagnosis of all stages of ectopic pregnancy the fact that intrauterine pregnancy may coexist should never be forgotten.

(4) When the term of pregnancy is completed and spurious labor supervenes the diagnosis, if not previously made, will be established with special difficulty. The pains are well defined, contractile, gradually increasing in duration and severity, recurring at intervals and gradually subsiding. After spurious labor and the consequent death of the fetus marked changes are observed in the fetal and maternal structures. The placental circulation continues for some time after the death of the fetus. The abdomen is usually decreased in size, fetal movements cease, and the uterus undergoes involution. In a certain proportion of cases the gestation sac and fetus undergo necrotic changes and break down into a gangrenous, suppurative mass. Hectic fever and general septic symptoms of severe type at once appear. After a severe and protracted illness pus may find outlets, single or multiple, through the abdominal wall, rectum, vagina, or bladder, to be followed by the débris of the macerated fetus. In some instances the fetus undergoes mummification, calcification, or is converted into a lithopedion, so that the septic symptoms mentioned may be modified or be altogether absent, in accordance with these varied methods by which the fetus and secundines are managed by the digestive activity of the peritoneum.

In the presence of active symptoms, suggestive but not confirmatory of ectopic pregnancy, diagnosis should be established by exploratory incision.

TREATMENT OF ECTOPIC PREGNANCY

The treatment of ectopic pregnancy is exclusively surgical. While recovery may eventually take place under expectant methods of treatment, the larger proportion will be saved by prompt abdominal section and removal of the affected tube and its contents. In the following classes of cases, viz., (1) unruptured tubal pregnancy, (2) cases of rupture without severe symptoms, (3) cases of rupture with developing infection, Schauta has shown that the mortality of ectopic pregnancy, when uninterfered with, is over 65 per cent., while the mortality in cases treated by prompt surgical intervention is less than 6 per cent.; from which it is apparent that the patient is exposed to greater peril by expectant treatment than by early resort to surgery. The peril is, therefore, too great to indulge in even unnecessary delay.

The principles governing interference in these cases, as formulated by McMurtry, whose early extensive and successful experience entitles him to speak with authority, may be summarized as follows:

(1) Operation before Rupture.—Few cases of ectopic pregnancy will present themselves for treatment prior to the time of rupture, consequently it is exceptional that an opportunity is found for the simple and safe operation practicable at this stage. The *operation* consists of abdominal section and removal of the involved tube in a patient free from shock or hemorrhage, and where the condition is uncomplicated by inflammatory lesions (for operative technique see Procedure for Salpingo-oöphorectomy).

(2) Operation at Time of Rupture.—When rupture has occurred, especially if with extensive lesions, directly into the general peritoneum, immediate operation is a necessity to save life. The case is one of hemorrhage, and to arrest the bleeding is as imperative here as to secure the severed ends of a wounded blood vessel in other localities. The operation in these cases is one of emergency, oftentimes to be done immediately upon seeing the patient and recognizing the condition, with all the haste that is compatible with due regard to reasonable aseptic precautions.

183. McMURTRY PROCEDURE FOR IMMEDIATE INTERVENTION IN RUPTURED ECTOPIC PREGNANCY

(1) The patient is placed under the best aseptic conditions available, but in the presence of profound collapse from internal hemorrhage the hazard of possible sepsis is less than the hazard of further delay.

(2) An intravenous injection or a hypodermoclysis of normal salt solution is ordered.

(3) The patient is placed in the Trendelenburg position, and the abdomen is speedily opened in the median line.

(4) The uterine and ovarian arteries in the affected side are at once clamped.

(5) The ovarian vessels are ligated at both ends of the broad ligament.

(6) The Fallopian tube and ovary are cut away (Fig. 365).

(7) (a) If the surroundings are aseptic all blood found in the peritoneal cavity should be left there, as it will rapidly reabsorb and thus fortify the strength of the patient. (b) If the surroundings are dangerously uncertain with respect to asepsis the blood would better be washed out and a liter or more of normal salt solution left in the cavity. This is important, as the blood is a better culture medium than the normal salt solution.

(8) The abdomen is closed with or without drainage, as the indications may require.

The patient should be put to bed with her head low; nitroglycerin, strychnia, or adrenalin should be given to rouse the heart, and reaction should be promoted by hot water bottles placed to the extremities and over the epigastrium. These cases ordinarily make a speedy recovery, especially when they do not require drainage.

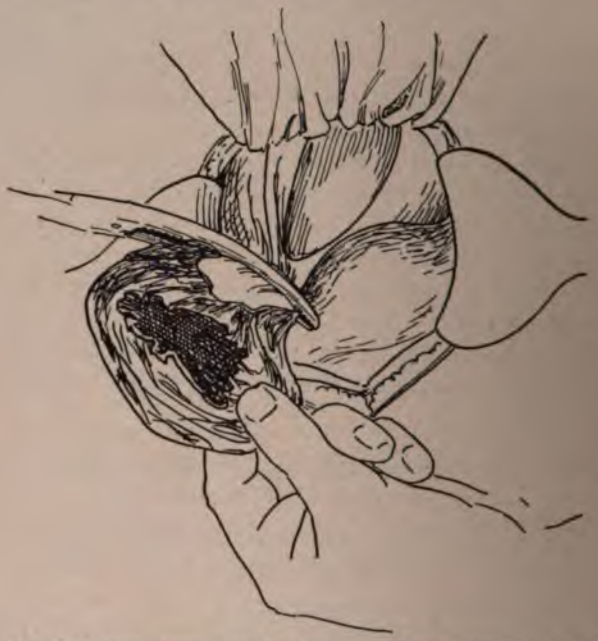


Fig. 365.—(183) Procedure for Immediate Intervention in Ruptured Ectopic Pregnancy. The ruptured sac has been brought up as quickly as possible and clamped preparatory to ligation.

(3) Operation after Rupture.—When reaction has occurred following rupture intervention can be practiced with more deliberation and with more reference to aseptic preparation. The technique and principles of procedure are the same as those just described.

(4) Operation in Advanced Ectopic Pregnancy.—The operative treatment in advanced ectopic pregnancy will vary as the fetus is living or dead, and according to the consequent state of the placental circulation. The placental site varies in these cases. It may be on the abdominal wall, on the uterus, or spread out most frequently over the broad ligament and uterus; in some cases it is also attached to intestinal and bladder surfaces. After spurious labor and the death of the fetus the placental circulation remains active for some time. Hençe, under these circumstances, it is best to defer operation for several weeks in order that the placental thrombi may become organized.

Then the placenta can be enucleated without serious danger from uncontrollable hemorrhage. The danger to life in those cases where the pregnancy has advanced beyond the fifth month, and especially in those that have gone beyond full term, is extreme. The difficulty centers about the removal of the placenta. When the placenta is spread out over the uterus and intestines, and the circulation through it is active,

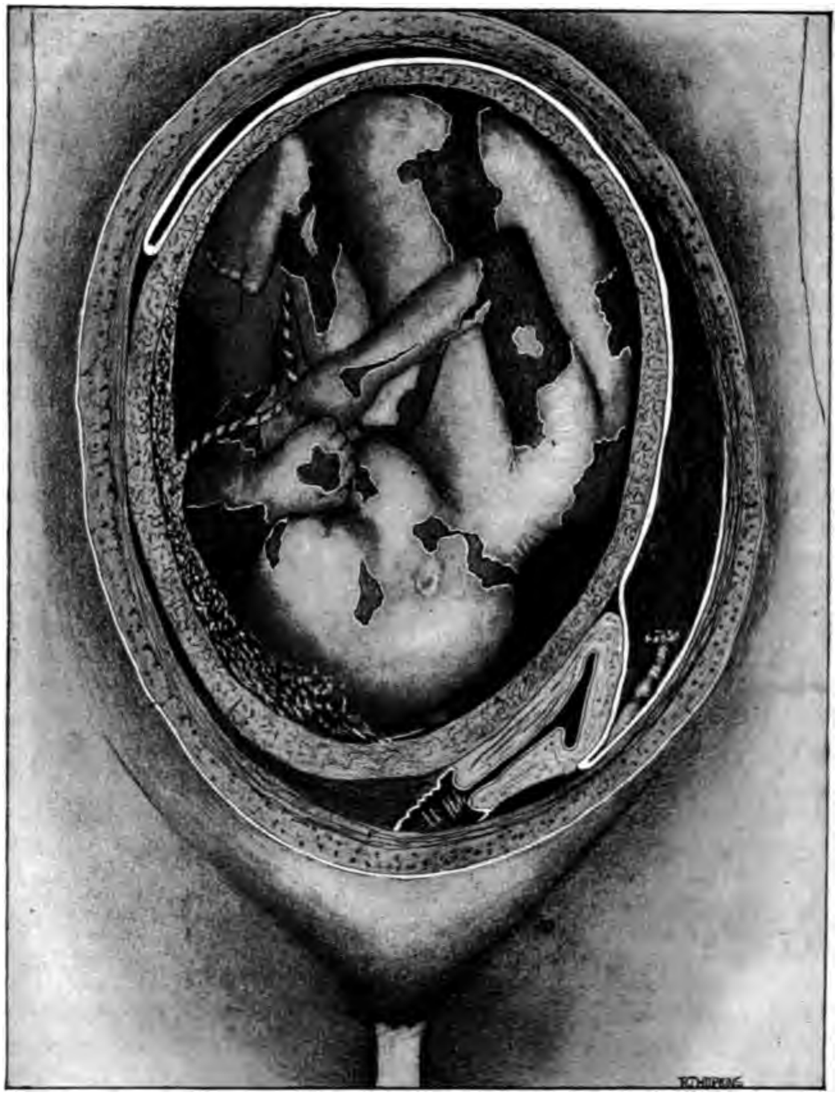


FIG. 366.—A PATIENT WHO HAD GONE TWO MONTHS BEYOND TERM, MACERATION OF THE FETUS HAVING COMMENCED.

a fatal hemorrhage will usually follow any attempt at its removal. If this condition is found to exist the cord is tied and cut short after removal of the fetus, and the sac is stitched to the edges of the incision after packing it with gauze, which is allowed to protrude from the lower angle of the incision. The danger here, too, is great, for the large mass is readily infected, and secondary hemorrhage will often ensue as the placenta breaks down. When the fetus is alive and viable operation should be done without waiting for the completion of the full term of pregnancy and spurious labor. In opening the abdomen the sac should be avoided carefully by diverting the line of incision. When the sac is opened the child is extracted and handed to an assistant. If the placenta is favorably situated it may be rapidly enucleated and the hemorrhage controlled by firm gauze pack. If the placental implantation is not favorable to enucleation the sac should be left open (marsupialization) and the placenta cut away, piecemeal, as it atrophies.

When the fetus has been dead for several weeks the dangers of operation are much lessened. In these cases it will often be practicable to remove the placenta at once without severe hemorrhage. When the fetus has been long dead and has undergone mummification, adipocere change, or calcification the operative procedure for its removal will present no additional difficulties, and can be conducted in accordance with the principle already set forth in this chapter. I operated on a patient at the Cincinnati Hospital who had gone two months beyond term, maceration of the fetus having commenced (Fig. 366). The child was removed by abdominal section and the sac sutured to the margins of the wound and packed with gauze, as the slightest traction on the placenta induced hemorrhage. The placenta was subsequently removed and the patient made a complete recovery.

CHAPTER III

RUPTURE OF THE UTERUS

Rupture of the uterus may occur (a) during pregnancy, when it may be either spontaneous or the result of traumatism, or (b) during parturition, when it occurs as a feature of dystocia.

RUPTURE OF THE UTERUS DURING PREGNANCY

Rupture of the uterus during pregnancy generally occurs during the first six months, the larger number of such cases occurring during the first half of uterogestation.

The most frequent cause is interstitial or cornual pregnancy (see Ectopic Pregnancy). The average period of rupture in these cases is between the tenth and fourteenth week. Pregnancy in a weak or a bicornuate uterus and deep placental implantation are recognized causes. The formation of connective tissue at the site of previous deep placental implantations, causing weakness of the uterine wall within that area, is spoken of by Jellinghaus as a predisposing factor. Deep deposits of cicatricial tissue due to previous Cesarean section or other injury, surgical or traumatic, of the uterus furnish areas of less resistance that are liable to give way under the expansive force of pregnancy. Prochin attributes rupture in certain cases to faulty development characterized by the relative absence of elastic fibers in the muscularis. It sometimes results from traumatism, such as a blow or fall, or from violent penetration by a foreign body (see Wounds of the Uterus).

After extensive research Blind stated that the accident occurs chiefly about the fundus. Baisch, however, found that in 32 out of 56 cases it occurred in either the anterior or the posterior wall.

Symptoms and Diagnosis.—Spontaneous rupture of the uterus during pregnancy may be so symptomless as to escape attention at the time of its occurrence. This was shown in a case reported by Henrotin in which, following symptomless rupture of the uterus, without disturbance of the placental implantation, the gestation sac escaped intact into the abdominal cavity, where for a time the fetus continued to develop. An essentially similar report was made by Leopold. In some cases, however, there is profound shock with the usual phenomena of hemorrhage, either concealed or external. If symptoms at the time of rupture do not attract attention to the occurrence evidences of peritonitis will sooner or later manifest themselves. The patient will have noticed that conditions have changed. On palpation, if necessary under gas-oxygen anesthesia, the fetus, if not susceptible of being definitely outlined, will be felt as a movable mass in the middle or upper zone of the abdomen.

Treatment.—See Treatment of Rupture of the Uterus During Labor.

RUPTURE OF THE UTERUS DURING LABOR

Rupture of the uterus during labor is fortunately of rare occurrence. It may be complete or incomplete. When incomplete it may pass without detection. At such times it is generally associated with laceration of the cervix. Incomplete laceration may extend through the muscularis of the uterus, stopping at the peritoneum. It was regarded by Lusk as more likely to occur in lateral tears at the site of the folds of the broad ligament, though, owing to the relatively loose attachment of the peritoneum at the lower segment, incomplete ruptures are not necessarily confined to those points. In the complete form the tear extends through the muscularis and the peritoneum, making usually a communicating wound with the abdominal cavity, although lacerations have occurred in that zone of the uterus which lies in normal attachment to the bladder.

The causes of rupture of the uterus may be summarized by saying that they may consist of any condition that interferes with the descent of the child, that favors the ascent of the body and fundus, or diminishes the normal powers of resistance of the uterine walls. A monstrosity, a hydrocephalic head, neglected shoulder presentation are examples of causes that may exist in the fetus. Fibroid tumors, distortion of the pelvis, and malignant disease of the cervix are among the maternal causes. Some writers have placed emphasis upon fatty degeneration of the uterine parenchyma as a demonstrated cause of this condition.

The mechanism by which uterine ruptures are caused was first satisfactorily explained by Bandl. He explained that in normal labor the contractions of the uterus resulted in a thickening of the fundus and body, while the lower segment was stretched and thinned by the downward pressure exercised by the presenting part of the fetus. This process was strictly physiologic, so long as no obstacle existed to interfere with the descent of the child. The natural result of this dilatation was the practical conversion of the uterus and vagina into a continuous canal. When labor was advanced the lower circumference of the body of the uterus was ordinarily distinguished from the stretched lower segment by the ridge induced by the contractions, and now known as the ring of Bandl. This ring was ordinarily found in the neighborhood of the pelvic brim, but its development was proportionate to the difficulty of the labor. In the presence of some obstruction to the normal descent of the child the retentive force exercised by the suspensory ligaments of the uterus resulted in the upward retraction of the fundus and body of that organ. This upward migration of the superior zone of the uterus resulted in a corresponding upward migration of the contraction ring, or the ring of Bandl. The ascent of this ring deprived the lower segment of the uterus of those accessions to its volume and resistant force, which, under normal circumstances, would be derived from the natural dilatation of the ring of Bandl. As a consequence the lower or cervical structures became stretched and thin, often to such a degree that they could no longer maintain their integrity against the expulsive and divulsive force from within. In this way, according to Bandl's explanation, the majority of all ruptures of the uterus begin in the lower segment, but become arrested by the now migrated ring of Bandl. In two cases in the author's practice the tear probably started in the lower segment and extended laterally toward the fundus.

Symptoms and Diagnosis.—Incomplete rupture of the uterus may be signalized by nothing more than an evanescent and not severe shock, a temporary interruption of the pains, and a persistence of hemorrhage after delivery. When the rupture is complete, however, the phenomena induced by the accident are striking and unmistakable. There is profound shock; the uterine contractions and pain cease instantly; the presenting part of the child recedes; the fundus of the uterus tilts to one side, or entirely disappears in the presence of a new, strange, and indefinite tumefaction within the abdomen; a bloody discharge makes its appearance; and frequently there is prolapse of the funis. A careful examination at this time will indicate not only a recession of the presenting part of the child, but an apparent atony of the cervical structures. If the child has escaped into the abdominal cavity the hand is introduced without difficulty into the uterus and may, in certain cases, be carried through the rent in the uterus into the peritoneal cavity. The diagnosis, according to Ludwig, is not always easy, even when the foregoing symptoms are taken into account. He has found the best diagnostic sign to be (a), in lateral rupture, the interruption of the natural contour of the uterine quadrant, when either a projection or a nodule is formed; (b) suddenly acquired abnormal mobility of the uterus; and (c) a sign upon which he places great emphasis, viz., emphysematous crackling at the seat of rupture. If the head presents and can be pushed back the bimanual examination under deep narcosis makes the diagnosis certain.

Treatment.—The treatment of rupture of the uterus, whether occurring during pregnancy or labor, is to be directed to the saving of the life of both the mother and child, when possible.

If the child is yet within the uterine cavity, the vertex presenting, forceps may be applied without delay; if breech or shoulder is presenting, and the child is known to be alive, version may be practiced. If the child is still within the uterine cavity, but is known to be dead, it may be delivered by craniotomy, *morcellement*, or by any other means that will most speedily empty the uterine cavity.

After delivery the uterine cavity should be carefully explored, and, if the rupture is found to communicate with the peritoneal cavity, an abdominal section should be done at once.

If rupture has been complete and has been followed by the escape of the child into the peritoneal cavity the child should be delivered by abdominal section. The same course is to be followed when the child has been delivered *per vias naturales*, and the placenta has escaped into the abdominal cavity; indeed, it may be adopted as a safe rule that the abdominal cavity should be opened whenever rupture of the uterus can be demonstrated to be complete, no matter what may or may not have passed through the rent. This conclusion is based upon the fact that, although neither the child nor the placenta may have escaped into the abdominal cavity, complete rupture could not occur without the escape into the peritoneal cavity of either blood, amniotic fluid, or other products of gestation liable to be either the bearers or the sources of infection. The abdomen should in such cases be opened and thoroughly washed out with normal salt solution. The author concurs with Whitridge Williams that probably the greatest number of both children and mothers will be saved by immediate operation and delivery by the abdominal route, irrespective of all conditions except the one fact that rupture exists. If hemorrhage is in progress it should be controlled either by the application of forceps to the broad ligaments, far enough down to control the ovarian and the uterine arteries, or by an elastic ligature temporarily applied below the site of rupture. The treatment of the uterus at this point is one of extreme importance. The rent may be closed, which is best done by paring the edges and approximating and closing them by the seroserous suture, adopted by Czerny and Lembert in Cesarean section (see Cesarean Section); or the uterus may be removed, converting the procedure essentially into a Porro operation. Unless there is extensive destruction of the tissues of the uterus, with obvious infection, its removal is not justifiable.

Women who have sustained rupture of the uterus and who have been successfully operated upon by closure of the tear have subsequently borne children. Deutsch reported a case of symmetrically contracted pelvis in which rupture of the uterus had been treated by abdominal section four years previously. The patient went to term, when examination revealed the uterus adherent to the abdominal wall, causing a marked projection of the abdomen. The fetus being found to be living, the patient was *narcotized,* the os was dilated, and a living child was delivered by podalic version. If carcinoma or fibroids are either the underlying cause or the associated condition of a rupture of the uterus no hesitancy about its ablation need be entertained. The operation should be done as soon after the condition is detected as necessary preparations can be made. The possibility of hemorrhage and the still greater possibility of infection make it imperative that intervention should be practiced as speedily as possible. Patients may, however, live for a considerable time after the occurrence of this accident, even without treatment. Thus, St. Braunwas reports a case in which he extracted the fetus by abdominal section six weeks after it had escaped through a rupture of the uterus into the peritoneal cavity. The fetus was bathed in pus, which filled the cavity of the abdomen. The patient, of course, died from chronic sepsis. In cases in which abdominal section is practiced the operation proper should be both preceded and followed by free administration of normal salt solution, either by intravenous injection or by hypodermoclysis.

184. PROCEDURE FOR RUPTURE OF THE UTERUS (CONSERVATIVE)

In the absence of active hemorrhage or of profound shock, and if some time has already elapsed since the accident occurred, it is safe to remove the patient to a convenient hospital. If the symptoms are active and severe, or if a hospital is not convenient, operation should be done at once.

(1) Open the abdomen in the median line by incision from the symphysis to the umbilicus.

(2) Explore the abdomen and the uterine surfaces.

(3) If the placenta is detached deliver both it and the fetus through the abdominal incision.

(4) If the placenta is not detached deliver the child through the abdominal incision and tie off the cord, as in a normal delivery.

(5) If the placenta is still attached apply long clamps to the broad ligament, embracing both the ovarian and uterine arteries on each side.

(6) Deliver the placenta through the rent in the uterus.

(7) Intrust the fundus to an assistant with instruction to make constant pressure with his hand to favor contractions.

(8) Remove all clots and amniotic fluid and cleanse the peritoneal cavity and the uterus by the copious use of tepid normal salt solution.

(9) Trim ragged or ecchymotic edges of the wound and apply a hot gauze to the trimmed surface.

(10) After a few minutes' application of heat to the wound and hand pressure to the fundus loosen, but do not take away, the forceps to test the tendency to hemorrhage.

(11) If hemorrhage is active control the bleeding points by individual ligature; if there is nothing more than oozing it will be readily controlled by the hemostatic (buttonhole) suture.

(12) Close the rent in the uterus by chromic catgut, used as a continuous hemostatic (buttonhole) suture, which should be passed down to, but not through, the mucous membrane (Fig. 367).

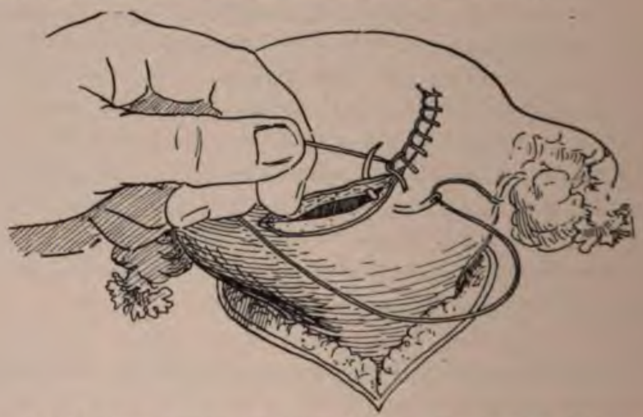


Fig. 367.—(184) Procedure for Repair of Ruptured Uterus (Conservative). Method of applying continuous hemostatic suture for closure of the uterine tear.

(13) Fortify the continuous suture with a few interrupted sutures of the same material. If the wound is angulated an interrupted suture should be placed at the angle.

(14) The toilet of the peritoneum is perfected and the abdominal wound is closed with or without drainage, as may be indicated.

CHAPTER IV

SURGICAL INTERVENTION IN DYSTOCIA

Embryotomy on the living child is a criminal operation, and will, therefore, not be discussed in these pages.

"It may be taken as a recognized rule in midwifery," says Murdock Cameron, "that no woman should be allowed to die undelivered without some attempt being made to save her and her offspring, or at least to save her, even at the expense of her child."

Concerning the latter point, whether we are justified in destroying the infant when alive, there has been, and still exists, difference of opinion, due in some measure to religious belief, and likewise to the personal feeling of the husband, who often felt that very little hope was held out to him that his wife could be saved by section. Among such men we had Napoleon, who, when appealed to by Dubois, said: "Treat the Empress as you would a shopkeeper's wife in the Rue St. Martin, but, if one life must be lost, by all means save the mother." In marked contrast to him we had Henry VIII, who, when thus questioned before the birth of his son Edward, exclaimed: "Save the child by all means, for other wives can be easily found." At the present time such men might be put down as either a good husband but a bad father, or a good father but a bad husband.

The doctrine of the Roman Catholic Church has been that, even though it would be impossible to extract the child without first killing it, to do so would be mortal sin; and likewise until lately it was held that the infant could not be baptized in the uterus, as it must be *natus* before it could be *renatus* by baptism.

Of late years the happy results following Cesarean section and Porro's operation have done much to efface the dreadful feeling that we have in such cases to decide whether the life of the mother or that of the child is to have our preference, seeing that it is now quite possible to save both.

Barnes wrote: "Cesarean section is resorted to with a feeling akin to despair. Embryotomy stands first, and must be adopted in every case where it can be carried out without injuring the mother. Cesarean section comes last, and must be resorted to in these cases where embryotomy is either impracticable or can not be carried out without injuring the mother. There is, therefore, no election. The law is defined and clear. Cesarean section is the last refuge of stern necessity."

As against this statement Barnes more recently said: "It is no longer permitted to us, without ample proof of clear necessity, to sacrifice the child in order to save the mother. The cases in which the two lives are supposed to stand in antagonism are vanishing before the light of modern science and skill."

"We must never forget that we have a sacred trust," exclaims Cameron, speaking from probably the largest world experience in Cesarean section, "and we have no right to sacrifice a child, however unequal its life may be in some cases to that of the mother." In advocating the preference for section as against craniotomy in the living child Cameron does so only after very mature consideration, and with a feeling that to do otherwise would be to sacrifice a life which we are bound to preserve. He thinks the time has come when the lives of the mother and child may alike be saved, and prefers to think that an infant come to maturity is destined for something greater than to have its glimmering life extinguished by an accoucheur skilled in the use of a dreadful perforator. Let our motto be, "We live to save and not to destroy."

SURGICAL ENLARGEMENT OF THE BONY OUTLET IN DYSTOCIA

In certain cases of dystocia it is thought wise to enlarge the bony outlet of the pelvis. This proposition is tenable when, the child being still alive, the conjugata vera measures 8 cm. or more.

This is accomplished by either one of two procedures, viz., that of Morisani (1881), known as symphysiotomy, and that of Gigli (1893) known as pubiotomy.

185. PROCEDURE OF SYMPHYSIOTOMY

(1) With the patient upon her back, her buttocks at the edge of the table, her legs flexed and intrusted to an assistant, the operator, facing the vulva, makes an incision in the middle line from a few centimeters above the upper margin of the symphysis almost to its lower margin.

(2) A finger, looped behind the symphysis, entirely separates it from the underlying tissues. This step often occasions profuse hemorrhage from the vesical arteries.

(3) The attachments of the clitoris are then cut away from the symphysis, generally by blunt dissection.

(4) A long metallic catheter is introduced through the urethra into the bladder, which is then pushed to one side.

(5) The pubic articulation is then severed by a strong hook-bladed knife, operating preferably from within outward. If the subpubic ligament is still intact it must be divided, or the bones will not separate.

The operation sometimes results in permanent enlargement of the pelvis, large enough in cases collected by Madame Wulff and Frank. The maternal death rate from the operation, based on the experience of Bar, Pinard, Küsler, and Zweifel, is 6.7 per cent., while the fetal mortality is from 9.39 per cent. in Bar's hand to 13 per cent. in Pinard's. From these figures it has no advantage over the Cesarean section.

Williams, speaking from ample experience, states that he looks upon symphysiotomy as a formidable operation, and one not to be lightly undertaken. The hemorrhage is often embarrassing, especially from the clitoris wound; the bladder is sometimes injured; the gaping of the pubic bone may do permanent damage to the sacroiliac articulation, while the character of the case and the location of the wound make it liable to infection. Gigli pointed out that the symphyseal wound not only healed slowly and was prone to infection, but deprived the urethra and clitoris of their normal support.

To overcome this last-named defect Gigli devised the operation of pubiotomy, which consists in dividing the pubis to one side of the symphysis.

186. GIGLI PROCEDURE OF PUBIOTOMY (DODERLEIN)

(1) An incision 2.5 cm. inward from the pubic spine is made just above the upper margin of and down to the pubic bone.

(2) After incising the periosteum the tissues are dissected from the posterior surface of the bone by finger dissection.

(3) A curved forceps is passed under the bone and pushed against the skin to indicate the point for the lower opening.

(4) A small incision is made over the tip of the curved forceps, which is then pushed through.

(5) One end of the protruding forceps seizes the Gigli saw (Fig. 368) and draws it through.

(6) The handles are then attached to the saw, with which the bone is then speedily divided. Care should be taken that the bone is completely severed and that the direction of the division is the most favorable in the given pelvis.

(7) The saw is withdrawn and the hemorrhage, which is active, is controlled by sponge packs.

(8) As soon as the blood is controlled the child should be delivered by forceps.

(9) The ilei should be compressed by assistants to prevent more than from 5 to 6 cm. separation of the pubic segments.

(10) A drainage tube is placed in the lower end of the wound.

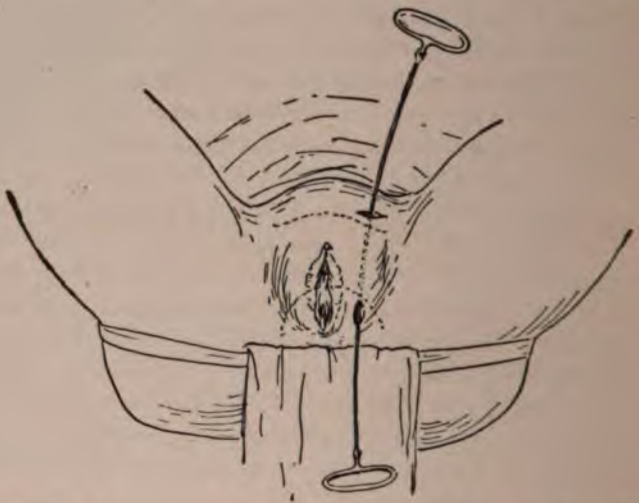


FIG. 368.—(186) PROCEDURE FOR PUBIOTOMY. Incisions made and Gigli saw adjusted. (After Whitridge Williams.)

(11) After the patient has been cleaned up a strip of porous adhesive plaster, 20 to 25 cm. wide, should be passed around the pelvis and hips to support the pelvic bones and to hold the pubic segments in apposition.

These patients do very well. Satisfactory union is generally prompt, and patients leave the hospital able to walk in about four weeks.

Our decision for operation should be based upon the degree of contraction of the pelvis, the size of the child's head, and its reducibility, unless the obstruction is due to some other cause, such as cancer or the presence of a tumor in the pelvic cavity.

Every practitioner should be able to form a fair estimate of the amount of contraction, as it is easier to measure a contracted pelvis than a normal one, and it does not require a highly skilled obstetrician to say before labor has commenced, or during the early stage of the process, that the diameter of the pelvis is or is not less than 3 inches; and, as a matter of fact, such a pronouncement should be within the skill of the ordinary practitioner, who should be more than a generally useful person, otherwise he will sink to the level of an ignorant midwife. Not only must he be able to form an estimate of the amount of contraction, but, by patient study of normal cases, he should qualify himself to form an opinion as to whether it will be impossible for a living child to pass, and also whether, under the difficult circumstances in which he may be placed, it would not be better to send the patient where Cesarean section could be safely performed than to extract a mutilated fetus through a minimum diameter.

With a diameter under 2½ inches, where engagement of the head is impossible, no one should hesitate to advise Cesarean section, although there will always remain cases, as where the child is dead or a subject of hydrocephalus, in which craniotomy may be resorted to.

CONDITIONS DEMANDING INTERVENTION BY CESAREAN SECTION

The indications for the conservative Cesarean section are to be found in (a) contracted pelvis, (b) placenta prævia.

In cases of contracted pelvis Cameron divides the indications into absolute and relative. The absolute indication exists where the deformity of the pelvis is so pronounced that the passage of even a mutilated fetus is impossible; while the relative is where a mutilated fetus may be removed by the natural passage with as good a result for the mother as, or even better than, that afforded by embryotomy. It is here that difference of opinion exists. Baudelocque admitted Cesarean section in cases with a conjugate diameter under 2½ inches; Cazeaux under 2 inches; Farnier 2 inches, and Depaul from 1½ to 2¼ inches when the child was alive, and under 1½ inches when the fetus was dead. Stolz advocated Cesarean section whenever the child was alive, and could be brought through the natural passage. Other authorities lay down the limits as follows:

Scanzoni	under 3 inches
Naegeli	under 2 inches
Spiegelberg	under 2 inches
Barnes	under 1½ inches
Playfair	under 1½ inches
Leishman	under 1½ inches

As early as 1900 the good results following Cesarean section in the hands of Cameron, Leopold, Sänger, and other operators have materially changed the views of many authors, who now favor Cesarean section more than they have done in the past.

Placenta prævia is recognized by many obstetricians as an indication for Cesarean section. This is undoubtedly justifiable in a considerable number of these cases, (a) when it can be made an elective operation with the patient under favorable surroundings, or (b) when dila-

187. CAMERON PROCEDURE FOR CESAREAN SECTION

(1) The *abdominal incision* should be made in the median line, as in ovariotomy, and it will vary in situation according to the distention of the abdominal wall (Fig. 369).

Thus, if the abdomen does not drop, an incision from 12 to 15 cm. in length may be obtained without extending beyond the umbilicus; but, when it is pendulous, the incision must of necessity extend more or less above the umbilicus.

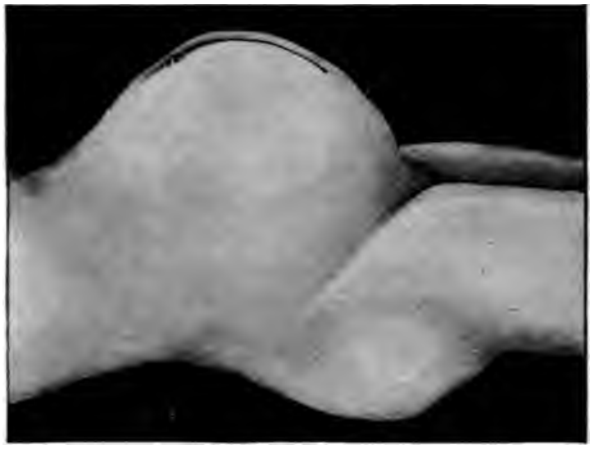


FIG. 369.—(187) CAMERON PROCEDURE FOR CESAREAN SECTION. (a) The line of incision in non-pendulous abdomen is shown.

(2) Before opening the uterus the operator should satisfy himself that that organ is not only in the median line, but that it is not twisted upon its axis. This is settled by locating the position of the Fallopian tubes by means of the fingers. He will frequently find the left tube more or less in front, as the uterus is usually rotated to the right. This displacement must be corrected, and, if necessary, an assistant can easily keep the uterus in position by pressing with his hand on the right side.

When the placenta has its attachment upon the anterior wall the site is seen to bulge, and upon palpation has a fluctuating feeling akin to that of a large pointing abscess.

(3) The next point is to open the uterus with as little loss of blood as possible, and this can be done by placing a flat vulcanite pessary upon the uterine wall around the point to be incised (Fig. 370).

The operator, with the fingers of his left hand, applies pressure upon the pessary, while his assistant does the same on the opposite side. The incision is then made with two or three strokes of the scalpel, and the blood sponged away by the assistant with his right hand. After this has been done no more bleeding takes place until the placenta is attacked in front, as the pressure with the pessary thoroughly prevents even oozing. Care should be taken not to puncture the membranes, which will soon be observed and recognized by their pearly color. If the placenta intervenes this method of pressure is beneficial, not only in preventing bleeding, but also in permitting observation of its tissue, which is recognized by its darker color.

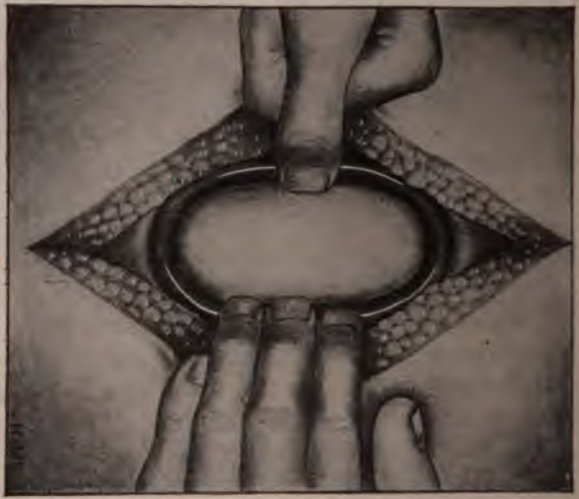


FIG. 370.—(187) CAMERON PROCEDURE FOR CESAREAN SECTION. (b) An oval ring of vulcanized rubber is pressed forcibly against the uterine wall surrounding the area where the incision is to be made.

(4) Whenever the membranes are reached a director is placed within the opening, which is then enlarged with a blunt-pointed bistoury upward and downward, as far as the pessary will admit.

(5) At this stage the compression pessary is removed and the incision extended upward and downward sufficiently to permit the passage of the fetus. The extension of the incision downward should be limited, as it is likely to interfere with proper contraction of the uterus. Should the placenta intervene it must be dealt with as a placenta prævia after completing the incision; that is, either separated upon one side, or, if central, pierced by the hand. There must be no hesitation in extending the incision, which is made upward and downward, from within outward, in each direction, with a blunt-pointed bistoury, to the length of about 12 to 15 cm.

(6) The left hand is inserted, without rupturing the membranes, till the head is being turned out, or the feet grasped, and then the child should be extracted without delay. On no account should the hand

be withdrawn after its insertion, unless during extraction of the fetus, as the uterus speedily contracts. If the shoulder presents a hand should be placed upon it to prevent its expulsion, as it adds very much to the difficulty when any portion of the child's body is allowed to protrude.

(7) The child having been extracted, the assistant places a large flat sponge over the upper angle of the abdominal incision to prevent the bowels from escaping, and then with both hands grasps the uterus, so as to prevent bleeding.

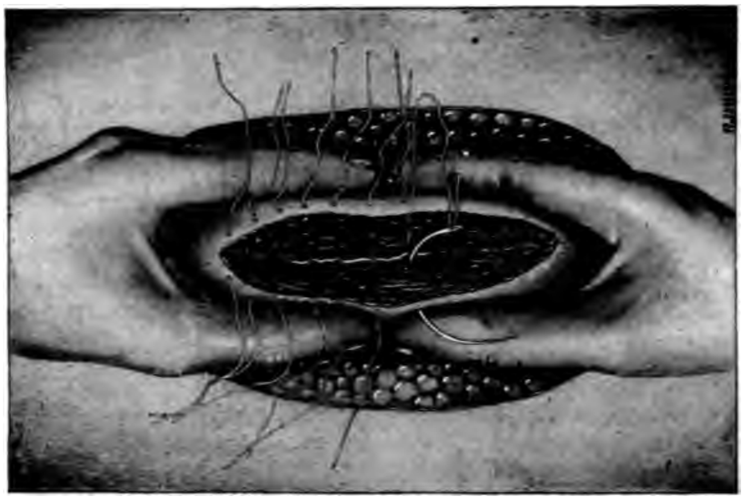


Fig. 371.—(187) Cameron Procedure for Cesarean Section. (c) Method of closing the uterine wound.

(8) The cord having been tied and divided, the placenta is immediately removed with the left hand, great care being taken to secure the removal of all membranes and to prevent the entrance of blood into the peritoneal cavity.

(9) The assistant now everts the uterus from the cavity and pushes a flat sponge behind it.

(10) The lips of the uterine wound are next everted, the assistant grasping the upper angle and wall with his right hand, and the lower angle and wall with the left.

(11) While the assistant holds the wound thus the operator immediately inserts the silk ligatures, beginning at the middle, each suture grasping the entire wall with the exception of the mucosa. From seven to ten sutures should suffice, as with the contraction of the uterus the incision is greatly diminished (Fig. 371).

After the ligatures have been cut short the next step is to ligate the Fallopian tubes with antiseptic silk and divide them, in order to prevent future conception. Of course, the consent of the patient for this procedure should be obtained beforehand. Two ligatures are tied upon each tube, which is then divided between those points. This method is effective, and leads to no complications or bad results, nor is menstruation interfered with. The cavity is next cleaned by the removal of all clots, etc., and the uterus replaced. The external wound in the parietes is closed in the usual way with silkworm sutures. The vagina should now be cleansed of all clots and sponged out, after which an antiseptic pad should be applied to the vulva.

188. SANGER PROCEDURE FOR CESAREAN SECTION

In this procedure the muscular wall of the uterus is closed with from ten to fifteen sutures, which approximate to, but do not include, the mucosa, and between each suture two superficial sutures are inserted to unite peritoneum to peritoneum (Fig. 372). Formerly the peritoneum was separated from the muscularis, and a wedge-shaped piece of muscularis was removed from each side, the base of the wedge being outermost. This done, the peritoneal flaps were folded into the wound and secured by the superficial stitches. Such a detailed process is quite unnecessary, as the sutures as recommended by Cameron secure perfect apposition, not only of the muscular tissue, but also of the peritoneum. In fact, most operators now make use of only eight or ten deep sutures, and reserve superficial sutures to secure contact where there is any gaping between the stitches. Such unevenness can be readily avoided by beginning in the middle and working toward each end, and by taking care to keep the sutures at regular intervals.

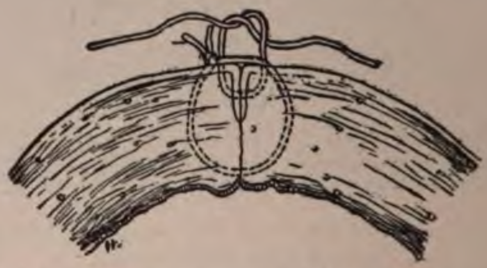


FIG. 372.—(188) SANGER PROCEDURE FOR CESAREAN SECTION. (a) Method of closure by a double row of interrupted sutures.

I have found the most practicable method of closing these wounds to be by continuous hemostatic suture of catgut, passed through the inner half of the uterine wall down to, but not through, the mucosa. This is supplemented by a superficial row, controlling the outer half of the wall and approximating the peritoneal margins (Fig. 373).

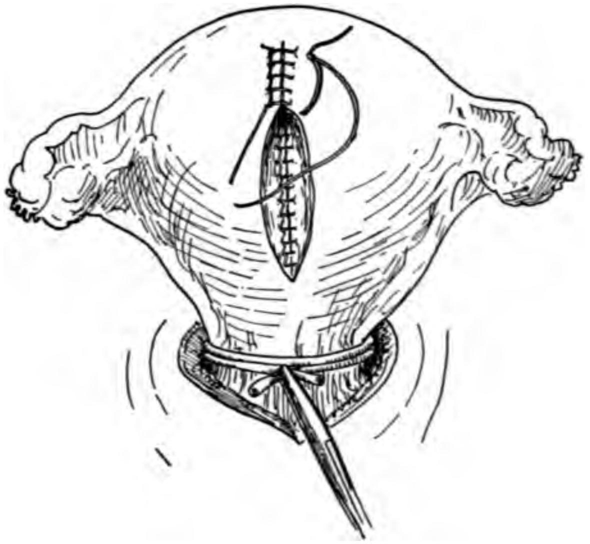


FIG. 373.—(188) SANGER PROCEDURE FOR CESAREAN SECTION. (b) Author's method of closing the uterine wound by a double row of continuous hemostatic sutures.

189. MANN PROCEDURE FOR CESAREAN SECTION (CELIO-HYSTEROTOMY)

(1) The abdominal incision should be made in the median line, and from 15 to 20 cm. in length, beginning a little above the umbilicus. When the abdomen is emptied of the enlarged uterus the incision will be much smaller than at the time of the operation. Care should be taken in cutting through the abdomen not to go too rapidly, so as to injure the uterus.

(2) After the abdomen is opened and hemorrhage from the abdominal walls controlled, the uterus may be incised *in situ*, or may be raised out of the abdominal cavity (Müller).

(3) As a preliminary a piece of elastic tubing should be placed around the cervix, to act as a tourniquet. This may be tightened by an assistant, if necessary, to wholly or partially control the blood supply. It should not be tightened until needed. Leopold is a strong

advocate of this procedure, claiming that it does not predispose to post-partum hemorrhage, and that it enables the operator to be more at his leisure (Fig. 374).

(4) There are at present two locations advocated for the uterine incision. One is the ordinary incision in the median line, and the other in the fundus between the cornua (Fritsch). This may be decided by the preferences of the operator, or he may be influenced by the position of the placenta. Leopold claims that the position of the placenta may be shown by observing the distance between the round ligaments. It is a frequent observation that the implantation of the placenta on the anterior wall may be recognized by the bulging of this wall. Palm has shown that the position of the placenta may be recognized by external palpation and inspection before the operation.

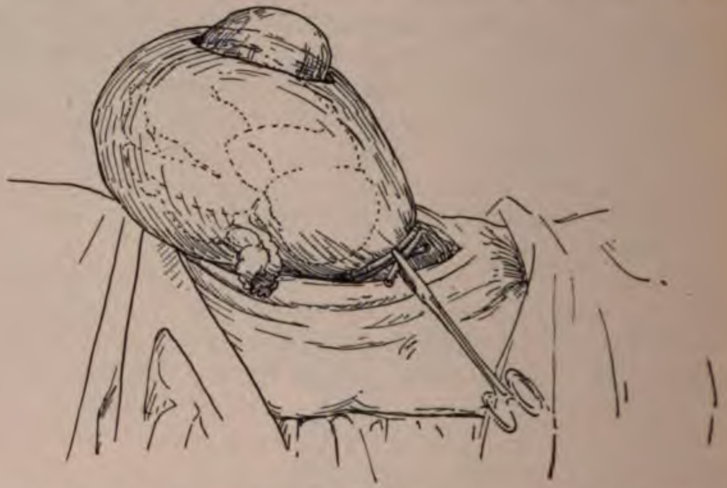


FIG. 374.—(189) MANN PROCEDURE FOR CESAREAN SECTION. The elastic ligature applied, the incision made, and the unruptured sac protruding.

If the placenta be found in front Fritsch's incision would seem to offer an advantage, though, in a certain percentage of cases, the placenta has been found attached partially to the fundus. The other advantages claimed for Fritsch's incision are: ease of extraction of the child, lessened hemorrhage from the uterine wall, broader surfaces for union, and smallness of the incision after the uterus has retracted, requiring in some instances only 7 (Hain) stitches. The advantages of the usual incision are: The accessibility of the interior of the uterus; the greater convenience for closing the wound, and the possibility of enlarging the incision to almost any length. Should the placenta be in front this incision will cause more loss of blood.

The uterine incision should be made, slowly and carefully, down to the amniotic membrane. It should then be rapidly enlarged with blunt-pointed scissors, but without opening the membrane. The incision should be about 6 inches in length, and should not go below the retraction ring. It is better to make an incision of sufficient size than to have a jagged tear made at the time the child is removed.

(5) After the incision has been made its full length down to the amniotic sac, this membrane may be rapidly opened and the child extracted, the first available extremity being seized. An assistant should hold the uterine wound opened with hands or retractors.

If the head be impacted in the pelvis, as may sometimes be the case (as, for instance, in atresia of the vagina), there may be some delay in getting the head out. Very considerable force may then be necessary. It must not be forgotten that atmospheric pressure may prevent the delivery of the head, and care should be taken to allow the air to enter. If the placenta be in front, with a longitudinal incision, it should be pushed to one side, or torn through, and the child rapidly extracted, and the placenta removed immediately afterward. After the cord has been clamped the child is handed to an assistant, who attends to its revival if it be asphyxiated, as is very commonly the case.

(6) After the child and the placenta have been removed the uterus should be forced to contract by manipulation, the application of hot towels or sponges, or an injection of very hot saline solution, which should have been prepared beforehand. As an additional excitant, if contractions do not follow, the endometrium may be painted with tincture of iodin. If labor has not come on a hypodermic injection of ergot, given at the beginning of the operation, may aid in securing efficient contractions. The anesthetic should not be pushed at this stage of the operation. If the patient be allowed to come partly out from the anesthetic the uterus will contract more vigorously.

No uterine douche should be used unless it be to excite contractions. Care should be taken to see that the os and uterine canal are open for drainage.

(7) After the uterus has contracted the uterine wound should be carefully closed. For this purpose I favor the use of catgut. Formalin catgut will last long enough to secure perfect union. There is no necessity for more than two rows of sutures—one of rather large catgut to embrace the muscular wall of the uterus without penetrating the decidua. This should be an interrupted suture, the stitches being placed about half an inch apart. The peritoneum should then be brought carefully together, the edges inverted with the Lembert suture, using finger catgut. Silk is used by the majority of operators, but has the disadvantage that it is more likely to become infected than

the catgut, and may form abscesses, which will not heal until the silk has been removed. Catgut properly prepared is perfectly reliable. Those who do not have faith in catgut may use the kangaroo tendon, but I cannot see why one is any better than the other. If the Fritsch incision has been made the same procedure is applicable to that.

(8) After the uterus has been closed the blood and liquor amnii should be carefully removed from the abdominal cavity, the uterus returned to its place, and the abdominal wound closed according to the preferences of the operator. The patient is bandaged and placed in bed. Leopold claims that excessive distention of the intestine will be avoided if, before returning the uterus, the small intestines are all removed from the true pelvis. If there is much shock a pint of hot coffee should be thrown into the rectum.

CELIOHYSTERECTOMY

The fatal results following the early Cesarean section led to a modification of the operation. It had been found by experiment that the uterus in pregnant rabbits could be removed with better results than by simple section, and, therefore, it was concluded that similar results would follow in the case of women.

Blundell, in writing upon this subject, said such a method might prove an eminent and valuable improvement, but he also wrote, in speaking of deaths from peritonitis after Cesarean section, that experience sometimes contradicted our most cherished opinions, and that something of the kind would be found to occur in the cases under consideration, as he had no doubt that the risk of diffused peritonitis had been greatly exaggerated. How his surmise has proved true is seen in the present-day position of abdominal surgery.

Acting on the lines suggested, Storer, of Boston, in 1868 first practiced amputation of the uterus after section. The case was one of pregnancy complicated with a fibroid of the uterus. He was interrupted by such an alarming hemorrhage that he had to remove the body and fundus with the ovaries, but his patient died three days afterward. This was an operation of necessity.

Porro first performed the operation as a matter of choice, as he considered it impossible to secure the uterine incision in Cesarean section so fully as to prevent the flow of blood and septic fluid into the peritoneal cavity. The results obtained under antiseptics in other abdominal operations encouraged him to make the attempt, and in 1876 he did so, with happy results. Others took up the operation, and very quickly the old Cesarean section was superseded by it; but only for a few years, for Cesarean section can now be performed without the slightest danger from bleeding, peritonitis, septicemia, or other dangers that Porro's operation sought to avert.

At the present day Porro's operation is an operation of exception, that is, only necessary in some conditions, such as serious rupture of the uterus, or where labor is obstructed by a large fibroid.

190. PORRO PROCEDURE FOR REMOVAL OF THE PARTURIENT UTERUS (CELIOHYSTERECTOMY)—MANN

(1) The incision, made in the median line, may be extended lower than in the Sänger operation.

(2) The tourniquet is then applied.

(3) (a) If the child be alive the same steps should be followed for its extraction as in the preceding operation. (b) If the child be dead, and the uterus septic, then the entire uterus should be raised from the abdomen, sponges or towels being placed behind it, and not opened until after its removal (see Procedure for Supravaginal Hysterectomy).

(4) The operator has the choice of using clamps and tying the vessels after the uterus is removed or of tying as he goes. The latter plan seems preferable. The first ligature should be placed beyond the tube and ovaries on the broad ligament, so as to include the ovarian artery. The round ligaments should then be tied, after which the peritoneum should be incised all the way around the uterus. It can then readily be pushed down so as to separate the bladder from the cervix.

(5) After the cervix is freed of peritoneum the uterine arteries should be tied on each side, when the cervix may be either taken out completely or cut off a little below the internal os. If the cervix be infected or be the seat of a cancer, or be very much injured by previous manipulation, or if it be the seat of marked laceration from previous labor, it should be entirely removed.

(6) Usually very little hemorrhage will be encountered. All bleeding points should be carefully secured with fine catgut ligatures. As the uterus can be drawn well up out of the pelvis the Trendelenburg position is hardly necessary, though some have advocated its employment.

(7) The next step is to pass a piece of iodoform gauze through the cervix into the vagina, the upper end of it being left projecting a slight distance above the cervix. The object of this is to prevent an accumulation of blood below the closed peritoneum and above the cervix.

(8) After this the peritoneal flaps should be carefully trimmed, and then brought firmly together with the continuous catgut suture, all

stump being turned in and covered by peritoneum. The abdominal wound is then closed and the patient treated as in the other operation.

Vaginal Cesarean section as the report now stands has nothing in particular to recommend it in view of the excellent results [illegible] by the abdominal operation.

CHAPTER V

INVERSION OF THE UTERUS

Inversion of the uterus means a turning inside out of that organ, and consists of the invagination of the fundus into or through the cavity of the womb. This form of displacement is not frequent; Braun and Spaeth report that not a case of complete inversion of the uterus has occurred in 250,000 births in their clinics; while it has been observed but once in 191,000 deliveries in the Rotunda Lying-in Hospital of Dublin.

The causes of inversion of the uterus are generally, but not always, connected with parturition. At this time, when the uterus is enlarged and its walls are softened by the ordinary evolutional changes of pregnancy, but two additional conditions are required to render inversion probable, viz., relaxation of the uterine wall and downward traction upon the fundus. This traction may be exercised by drawing upon the cord in a case of fundal implantation of the placenta; or, given a case of adherent fundal placenta, the involuntary efforts of the uterus to expel the afterbirth may cause the latter to drag the fundus downward into the cavity, or, for that matter, through the open cervix into the vagina. A large pedunculated polypus attached to the fundus of the uterus and finally expelled by that organ may, by persistent traction, induce inversion in the non-pregnant uterus. Three cases of this kind came under my observation. Small sessile fibroids have been found in the wall of the inverted uterus, and have been construed as causes of the condition. The mechanism of inversion in these cases has been explained by Treub, who states that in them there "is no regular contraction of the uterine wall, and that there can not be. The base of a sessile tumor can not contract, because of the implantation of the tumor, which diminishes or altogether abolishes the contractility of that part of the wall, and it can not be that only the contractility of that base is diminished; the surrounding parts must necessarily be feebler within a greater or smaller circumference. If from the outset the tumor was intramural, the smaller degree of resistance of that part of the uterine wall, coupled with intraabdominal pressure, may occasionally bring about a slight beginning of inversion. And when this is the case the conditions are essentially the same for sessile and intramural tumors, and for the partial inversion described by Rokitansky. A circle of uterine tissue is abruptly curved in the place where Rokitansky found the external indentation. I need hardly say that in that incurved circle the uterine muscle must be absolutely paralyzed. And this paralysis, again, will not be confined to a linear circle, but, gradually diminishing, will extend over a greater or smaller surface. The contractions of the normal part of the uterine wall will try to expel the part of the wall that acts as a foreign body. These expulsive efforts may slightly increase the inversion as far as the paralysis surrounding the circle of inversion permits, thus displacing the circle itself, and paralyzing another part of the uterine wall. Necessarily the extension of the partial paralysis proceeds farther in the uterine wall, too, and, by the repeated action of this muscular play, the inversion may gradually become complete as regards the body of the uterus. As soon as the body is inverted there is no longer any excitement for uterine contractions, and the inversion of the cervix generally does not take place. And it is the intraabdominal pressure, again, that may invert the cervix, too."

Inversion of the uterus may be complete or incomplete; in the former case the organ is turned completely inside out, the inverted fundus and body of the uterus lying within the vagina, or protruding from the vulvar orifice. The condition may also be described as recent or old, acute or chronic, the one type being represented by the recent inversion of the organ with its attendant alarming symptoms; the other when the condition, either complete or incomplete, has occurred, involution of the uterus having taken place after the occurrence of the displacement, which remains in a chronic and more or less permanent form.

The pathology of this condition is by no means distinct. When the accident occurs in the puerperal state the probably one essential factor in its causation is uterine inertia, which is a functional rather than an organic condition. After the occurrence of puerperal inversion the womb, if left in position, seems to undergo the ordinary course of involution. Aside from the malposition there seems to be no special pathologic state induced. Treub, of Amsterdam, made a careful microscopic examination of a uterus which he removed for non-parturient inversion, and found the muscular structure normal, with absolutely no appearance of atrophy. There existed, however, a very edematous hypertrophy of the exposed mucous membrane.

Jones, of Omaha, reports a case of spontaneous reduction of an inverted uterus three years after the occurrence of the accident. Crosse studied the histories of nearly 400 cases, with the result that he ascertained the mortality from this condition to be nearly 35 per cent., death occurring either very soon after the accident or within a month. Of 109 fatal cases the fatal termination in 72 ensued within a few hours, and in the majority within half an hour. Eight died in from one to seven days, and six in from one to four weeks. After the first month the danger is slight, but it begins again with the resumption of menstruation, which has a tendency to become hemorrhagic. Crampton reveals the fact that of 120 recent cases 87 recovered, 32 died, 1 remained unrelieved. Twelve of the cases, however, were moribund when first visited. In the fatal cases reposition was usually effected readily enough, but too late to save life. Of 104 chronic inversions 91 recovered, 7 died, and 6 remained unrelieved. The average mortality, as shown by Crampton's table, is about 20 per cent. Pregnancy may occur, followed by normal delivery, in cases in which the uterus has been inverted and has either reduced itself spontaneously or has been reduced by operation.

Symptoms and Diagnosis.—The symptoms of inversion of the uterus following parturition consist, first, in profuse hemorrhage ensuing upon the delivery of the placenta; or when the fundus is drawn down by the still adhering placenta the latter may be peeled off by external action, and violent hemorrhage ensue. Physical examination should be made at once by the bimanual method. The intravaginal finger will detect a globular mass, presenting either just without or just within the thoroughly relaxed cervix; while the hand upon the abdominal wall will readily detect the disappearance of the fundus from its normal site, with the development of a distinct ring at the point of its disappearance. In an interesting case reported by Cordier, wherein an inversion had followed an operation for the removal of a polypus, the symptoms during the next few months were those of frequent yet slight discharge of blood-stained fluid from the vagina; there were no menstrual pains, nor was there a history of extrusive contractions of the uterus. Digital examination revealed in the vagina a pyriform mass about 3 inches in length by 2.5 inches in breadth, of a soft and velvety nature, and not painful to the touch. The finger could be carried all round the mass, which disappeared through the os by a constricted neck, and could be swept around the neck of the mass for nearly an inch within the cervical canal. The speculum revealed the openings of the Fallopian tubes on the presenting aspect of the mass. A probe could be easily introduced into the uterine ends of the tubes under vision while the speculum was in position. Such appearances as the foregoing, coupled with the disappearance of the fundus from its normal situation, as determined by bimanual exploration, comprise the essential diagnostic criteria in these cases.

If the abdominal wall is thick, and the condition of the uteru particularly in non-parturient or in chronic cases, can not be outlin by the bimanual manipulation, the index finger of one hand should introduced into the rectum while a sound is passed into the bladde if the sound and the finger meet above the presenting tumor the e dence is conclusive that inversion exists.

TREATMENT OF INVERSION OF THE UTERUS

The treatment of inversion of the uterus is manipulative, instr mental, and surgical. It must be further varied to meet the deman of (a) recent or acute cases and (b) long-standing or chronic cases.

RECENT OR ACUTE CASES

Recent or acute cases of inversion of the uterus, when complet demand attention, first, to stop hemorrhage, and, second, to reduce t dislocation.

Hemorrhage in acute inversion of the uterus is frequently ve severe at first, but is generally soon arrested by the spontaneous co traction of the cervical ring. The early hemorrhage should, howeve be promptly controlled by pressure. In adopting this treatment it important to remember that the everted surface of the uterus is in co dition readily to become a portal of infection, and that the tissues a soft and relatively of feeble resistance.

191. PROCEDURE TO ARREST HEMORRHAGE IN ACUTE INVERSIO OF THE UTERUS

(1) Envelope the uterus in a hot sterilized pack wrung out o a hot solution of carbolic acid (3 per cent.) or lysol (5 per cent.), o still better, hot dilute acetic acid (vinegar).

(2) Encircle the cervical portion of the uterus several times wit rubber tubing, if at hand, or an inelastic band, if the tubing is no available, wrapping it outside the towel to prevent cutting of the uterine tissue.

(3) Keep up the application of hot water or hot vinegar for fifteen or twenty minutes.

(4) Gradually loosen the constricting band, watching the effec upon the hemorrhage; if it recurs again tighten the band; if it ha ceased remove the band entirely and at once begin manipulation fo reduction of the displacement.

192. PROCEDURE FOR REDUCTION OF ACUTE INVERSION OF THE UTERUS BY MANIPULATION

(1) With the patient on the operating table, or with her buttocks at the edge of the bed, her thighs well flexed, place one hand over the abdomen and press down firmly until what has now become the cervical ring can be felt and steadied under the hand.

(2) With the other hand grasping the everted fundus, press it upward in the direction of the long axis of the pelvis.

(3) If reposition is not readily effected by this means, i. e., if the cervical band has already locked the uterus in its everted condition, the counterpressure from above should be discontinued, and that from below should be kept up until it has become apparent that reduction cannot be effected by manual force.

Mechanical repositors, consisting of a staff with a bulbous extremity, may be made from wood or other material and used with persistent pressure. Lawson Tait utilized constant elastic pressure, which he applied to a repositor by means of an elastic perineal belt fastened before and behind to an abdominal girdle. There are some dangers attached to this method of treatment. If the intrauterine extremity of the repositor is not very blunt, or else bulbous or cup-shaped, an apparently slight elastic pressure may be sufficient to force it through the soft uterine tissues. Then, too, if the repositor with a large bulb or a cup-like intrauterine end succeeds in accomplishing its purpose, the instrument itself may become incarcerated by contraction of the cervix. While this complication is by no means insurmountable, it has proved embarrassing. If the extemporized repositor is made of wood or other porous material it may speedily become septic, and a consequent source of extreme danger. To avoid this accident it should, if conveniently possible, be given two or three coats of shellac before being used.

CHRONIC CASES

193. KEHRER PROCEDURE FOR REDUCTION OF CHRONIC INVERSION OF THE UTERUS

(1) Draw the inverted uterus down to the entrance of the vagina.

(2) Divide the anterior wall from the os externum to a little below the middle of the corpus, and extending through into the peritoneal cavity.

(3) If found necessary separate the bladder from the cervical wall.

(4) The inversion is then reduced by such manipulation, manual or instrumental, as may be found necessary for the purpose.

(5) After reduction has been effected, and with the uterus no drawn down by the cervix, the incision in the anterior wall of th uterus is closed by interrupted catgut sutures.

(6) The incision between the cervix and the bladder is now close by interrupted sutures.

Hirsch operates by utilizing the posterior rather than the anteri wall of the uterus for incision.

If neither of these methods should prove available reduction coul be effected by complete hemisection of the uterus and the perfect r union of the parts by sutures through an abdominal incision.

The treatment of *chronic inversion* of the uterus has been a sourc of great perplexity since the days of Hippocrates. This master geniu described with great fidelity the condition of inversion, which he treate by placing the woman on her back, upon a couch, elevating her fee extending her legs, and applying compresses and sponges against th tumor, holding them in place by means of a perineal bandage. Thi was kept up for seven days. If it failed the woman's womb was anointe she was fastened by her heels to a ladder with her head hanging dow and was violently shaken, with the object of thus reducing the displace organ. Strange as it may seem, Castex, as late as 1859, reported th successful adoption of this Hippocratic practice by a Moorish midwif at Tangier. The condition and its treatment through the succeedin centuries commanded the attention of Rhazas, Avicenna, Aretæus, an Themison among the ancients.

Various modern methods have been devised to effect the reductio of chronic inversion of the uterus. White, of Buffalo, as long ag as 1858, published a plan of reduction by continued pressure, whic he applied by adjusting the soft rubber cup-shaped end of a reposito against the presenting fundus of the uterus; to the other end of thi repositor a spring capable of maintaining ten pounds pressure was ad justed, and so arranged as to lie against the breast of the operato Pressure was thus exerted, while counterpressure was made by the hand against the cervical ring, the pressure being exercised through the ab dominal wall. This method was modified by Tyler Smith, Aveling Wing, Robert Barnes, Lawson Tait, and others, but with no essentia deviation in principle.

Carl Braun in 1851 introduced a method of reduction by vagina tamponade by means of a caoutchouc bag, which he called a colpeuryn ter. When this bag is properly adjusted to the uterus the latter i pressed upward in such a way as to place the vaginal attachments upo the stretch, causing them to draw open the cervical cavity by latera tension, thus acting not only as a dilator, but as a repositor. Neug bauer utilized an intravaginal elastic bag which was gradually distended with water from a high plane. The hydrostatic pressure thus induced is found to be effective, a case in which the inversion had existed for two years having been thus reduced in nineteen days. The patient suffered no pain and learned to fill and empty the bag herself when it was necessary to relieve the pressure upon the urethra.

When conservative means at reduction fail recourse must be had to surgical intervention. T. Gaillard Thomas advised an operation of forcible dilatation of the inverted uterine canal. This was practiced by first making an abdominal section, stretching the uterine tissues by means of a strong uterine dilator, and then reducing the uterus by conjoined manipulation. The mortality following this operation was large, and it has been practically abandoned.

Vaginal hysterectomy as a remedy for chronic and irreducible inversion of the uterus is not a modern conception. Themison suggested it B. C. 50, but it was not adopted in practice until Soranus, of Ephesus, amputated an inverted uterus about the end of the second century of our era. The suggestion has been recognized as one of practicability from that day until the present. In its adoption the general principles of technique should be observed that are outlined in the chapter on Vaginal Hysterectomy.

In view of the fact that the inverted uterus, when once restored, is capable of exercising the functions of reproduction, vaginal hysterectomy should not be performed in child-bearing women, so long as rational and safe methods, such as Kehrer's, or hemisection, are available for restoring the inverted organ.

SECTION IX

MENSTRUATION AND ITS DISORDERS[1]

CHAPTER I

NORMAL MENSTRUATION

If we say that menstruation is a sanguineous flow from the genitals of woman, lasting four days at each recurrence, and appearing at regular intervals of twenty-eight days from the dawn of puberty until the child-bearing period has passed, we have made a very fair definition; but every separate statement contained in it is subject to many exceptions.

For, in the first place, menstruation is not peculiar to woman. In her, to be sure, the function has risen to its highest; but, none the less, it is an inheritance, and she, in menstruating, is not unique. In a number of our domestic animals, at the time of maximum sexual excitement, there is a very notable flow of mucus from the vulva, and this mucus is oftentimes loaded with anatomical elements, young cells, and a small amount of blood. I have observed this tinge in the case of the cow and the mare, and it has been reported as present in the female dog and in a number of apes and monkeys.

Walter Heape has given an excellent account of Macacus rhesus, an Indian monkey, which has a definite breeding season, but menstruates with regularity through the whole year. At the menstrual period macacus displays a certain congestion of the skin upon the abdomen, legs, and tail, and to these simian symptoms adds the strictly lady-like features of swelling and congestion of the nipples and vulva and flushing of the face. At the same time there is a discharge of viscid menstrual fluid, mostly white, but containing red corpuscles, uterine débris, stroma, and epithelium. Menstruation in Semnopithecus, as observed by Mr. Heape, corresponds very closely to that in macacus.

---

[1] This Division was written by Dr. Dan Millikin, of Hamilton, Ohio, sometime professor of medicine at Cincinnati, and appeared as a chapter in a former publication ("A Text Book of Gynecology," D. Appleton & Co., 1901) issued under my editorship. As the present work is based upon an etiologic classification of subjects, the following pages, devoted to functional disorders, have no proper place in the body of the book. I, however, look upon Dr. Millikin's scholarly discussion as being so important in a scientific sense, and so attractive as a literary production, that I offer no apology for appending it in its entirety.

Curiously comparable to this is menstruation among the lowest savages of southern Africa. James Stirton, supporting a contention that menstruation is a product of civilization, says that in the lowest tribes accessible to him he found menstruation to be very scanty and irregular, and always inaugurated by a prolonged mucous flow which never became highly sanguineous.

RUTTING AND MENSTRUATION

There appears to be a gradation leading us from dry mammalian rut to the rutting with discharge of the highly artificialized domestic animals, thence to the menstrual rut of the quadrumana, and thence to the highly sanguineous flux of the human female. It is a biologic fact that the higher mammals menstruate when in heat; it is no slander to say that woman is in heat when she menstruates. Confirmatory of this is the fact, often obscured by the self-control belonging to women of the highest and most refined type, that the beginning of a menstrual flow tallies with an acme of sexual desire, insomuch that considerations of modesty and convenience will not always deter them from absolute solicitation at the menstrual time.

Against the identity of menstruation and rutting it has been urged that menstruation continues with regularity through the year, whereas rutting is a phenomenon of some particular time of the year; and the fittest answer is that females of those animals which have been most artificialized by domestication tend to come in heat at regular intervals through the whole year, after the manner of women. The mare, for example, tends to come in heat every three weeks, and the female dog who escapes pregnancy will also develop a regular period. That is to say that, when living under human conditions, they tend to human menstruation.

It should be noted that the heat of wild animals is determined by two causes, the arrival of spring and the greater food supply which comes after a time of relative scarcity in most climates. Human forethought and ingenuity have practically annulled the influence of the seasons, and have made the supply of food constant over the greater part of all the earth. But, where degraded tribes exist in primitive conditions, virtually in a feral state, we find that women return to the animal type of menstruation. In the long bright days of the Arctic summer the Eskimo men and women pass into a state of ecstatic sexual excitement which is terminated only by satiety and exhaustion. It is at this season that the women become pregnant for the most part. The comparatively refined women of Greenland often cease to menstruate during the long dark winters, and similar observations have been made in the high mountain regions of France and Switzerland. Barnes says flatly that some women menstruate only in warm weather. The immigrants who came to our shores forty years ago, after long voyages on short rations, came, as was often observed, in excellent health, but in a condition of amenorrhea. In our north temperate zone it can be shown that women of the robust type who nurse their children and do not limit their fecundity have a tendency to bear children every second year in midwinter. So frequently does this occur that it leaves room to question whether there may not be still a breeding season for the human female, a faint fossil relic of primeval times.

In a comparative study it must ever be remembered that perturbing influences tend to induce a more prolonged and uniform sexuality in the human female. Her purely animal lust is complicated with spiritual affection for her mate, and this is in conformity to high poetic ideals; it is fused with esthetic ideals, also; it finds its ethical restraints; and all of these human complications are only faintly prefigured in the psychology of the lower animals at the breeding age and the breeding season. With woman primeval sexual instincts are continually cooled by prudence, modesty, conventional prudishness, and high intellectuality; it is inevitable that advancing refinement and even increased comfort in life should cause the phenomena of rutting to take on a less furious character, and, as a rule, to assume a more uniform character throughout the year. And so the cycle of human rutting becomes much [illegible].

It is not probable that the function of menstruation will disappear in the course of ages, but in its last waning recurrences it will still be typical of the rhythmic functions. It is a law of life and of all activity. The respiratory movements are rhythmical, and by a deeper breath at every seventh or eighth respiration we graft rhythm upon rhythm. There is a recurrence of hunger and of the propensity to sleep which is not in every way correspondent with the needs of the organism. In healthy persons of both sexes there is a diurnal tide in the pulse rate, the respiration, the arterial tension, and the temperature. More than one competent observer has claimed the demonstration of that which is in every way analogous — a monthly movement in the adult male of the human species, during which the vital processes and the sexual appetite rise to a maximum and then fall to a minimum, so that the question has more than once been raised whether it is not true that men menstruate as well as women. And if we make the easy step from the physiological to the pathological we find the same inexorable law of rhythm in the periodical recurrence of malarian paroxysms which the plasmodium has not fully explained, of epileptic seizures, of maniacal crises, and in the characteristic fever curve of the acute infectious diseases. Even in the highest intellectual aotivity we find the same law, for the creative power of genius has its ebb and flow.

PERIOD OF APPEARANCE OF MENSTRUATION

That menstruation usually comes with puberty is a matter of common knowledge. In the United States that age may be put at fourteen years and six months, with wide individual variance from this average. Very frequently the function announces itself and is heard of no more for months; irregularity for the first year is too common to excite the alarm of most mothers.

Precocious menstruation may appear even in infancy. Hungry for marvels, women will often bring the baby's first diaper with a red stain upon it, and this presented for blood in the case of a boy, and for menstrual fluid in the case of a girl. In almost every case the red patch will be found to be gritty under the finger, and its free solubility in warm weather will confirm the diagnosis of red urates. Sometimes, however, in the case of girls a small amount of blood will be found to come from a vulvovaginitis, with or without gonococci. Even more rarely granulations exist about the urethral opening sufficiently large and weak to produce a stain of blood. I recall a very puzzling case of a little girl who did not cease to "menstruate" until after a course of antisyphilitic medicine. The mother's many abortions furnished the clew to a diagnosis, confirmed after years by the child's dentition and the development of periosteal nodes. But a menstrual flow from the uterus of a healthy child is not to be denied. It may appear under the stimulus of disease, as in a case reported by Gemmell, where a healthy girl of nine years, not hemophilic, had a flow of blood, squamous epithelium, and débris, which continued five days following the height of the eruption of measles.

There are many cases reported showing the menstrual tendency so strong that no stimulus of acute disease is needed to bring on the flow precociously. I know a case of two girls in whom puberty came, by gradual and symmetrical development, at the ages of eight and eight and a half years, respectively. Here menstruation was a mere incident to perfect womanhood, for, though these little women had not attained their full stature, they had acquired rich voices, they cared little for children of their own ages, one of them suddenly became very averse ternal genitalia were appropriate to a girl of thirteen or fourteen years. The abdomen was enlarged, and a fluctuating, thick-walled cyst was diagnosticated.

Sometimes the ripe femininity of these little creatures is attested by maternity. Thus, McLaury, of New York City, sent a girl of thirteen years to a lying-in hospital. From her earliest recollection she had cohabited with men and boys. It is an interesting fact that she was one of four children born to an unmarried woman.

In 1858 there was a young mother, not quite eleven years old, living at the public charge at Taunton, Mass.

Dr. Gleaves, of Virginia, has reported the case of a girl who at the age of ten years and two months was delivered of a child of five pounds. She had menstruated from the age of five years. She had no mammary development, and her baby, during its short life of one week, was suckled by its grandmother, who had a child of only a few months.

These last cases might hardly be called exceptional in warm countries, where men and women are so soon ripe and so soon rotten. In Ceylon a youth attains his majority at sixteen years, and one may find the girls mature at from eight to fourteen years. Even in Mexico it is not uncommon to meet with grandmothers who are but little beyond the age of twenty years, and some cases fall much within this limit. One author, representing no extreme views, has stated that the average age of first menstruation is twelve years at the tropics and sixteen years at the coldest civilized regions.

THE MENSTRUAL CYCLE

The menstrual month is a myth which has no other basis than the obscure moon worship, latent in our race. For each woman a definite and precise cycle is usually established, early in her menstrual life, but that cycle is seldom measured by precisely twenty-eight days. Vast numbers of women menstruate scantily every two weeks and enjoy perfect health. Upon inquiry it will be found that many women menstruate every three weeks. A very large number of women are delighted to know that they conform to the classic period of twenty-eight days, but make their reckoning from the end of one period to the beginning of the next, so that really they have a cycle of about thirty-three days. In the same group are those who complacently declare that they are regular as the clock because they menstruate always on the same day of the calendar month. I know a case of two sisters who were in excellent health, but much disturbed because of menstrual irregularity, and it took much patient investigation to determine the fact that they had periods of thirty-seven and forty-nine days, respectively.

There is, in truth, no normal period of menstruation except the sense that there is an average period of about twenty-eight da from which most women depart widely. Exact conformity to this riod brings no added grace, health, or fecundity; and, contrary to common belief among women, departure from it brings no peril. a general rule, women highly refined and of delicate tissues will m struate more frequently, while coarser, more robust women will m struate less frequently.

THE QUANTITY OF THE MENSTRUAL DISCHARGE

At each menstrual period the human female loses from 2 to ounces of fluid. As the estimate must be made from the collecti of a few hours, it is not surprising that the range of variation sho be so great. Individual differences are known to be very great, f while one healthy woman will have merely enough discharge to st her clothing, another, equally healthy, with like fixity of habit, w soak her cloths for two or three days.

No other mammalian female loses so much blood as woman. Th we explain, first, by the fact that the reproductive apparatus of lower animals has no other purpose than reproduction, whereas in highest of mammals it ministers to complex loves and likings and lu which are only incidentally or accidentally reproductive. If the sti ulus brought to bear upon the genitalia of the human female were thousand times less than it is it would still suffice for the perpetuati of the species. There is, therefore, an abnormally high functional tivity of the human uterus and all that pertains to it, if we all the lower animals to fix the norm, and with this go abnormal c gestion and a tendency to increased leakage.

In the second place it may be observed that the erect posture of human female distinctly invites a free supply of blood to the pel organs, and hinders its return to the heart. Such, indeed, is the l of all parts of the body lower than the heart. Man, the monarch all living things, erects himself in appropriate attitude and pays penalty of his arrogance by suffering from varices, hemorrhoids, a precarious nutrition of his hinder legs; his poor mate, to these les plagues, adds her characteristically profuse menstrual flow. We add, as a third consideration, that the delicate tissues of the hig civilized woman are poorly able to resist the influences which tend leakage of blood at the menstrual time.

In temperate zones the average duration of menstruation is ab four days and a half. In any locality may be found great numbers women who habitually menstruate two days, and as many who m struate seven days.

CHARACTER OF THE MENSTRUAL DISCHARGE

There are occasional cases which furnish what has been well called white menstruation. The subjects usually announce themselves as suffering from a leukorrhea, which is "very weakening." Investigation, after excluding gushes of fluid from diseased tubes, and after establishing the periodic character of the discharge, will properly refer it to an attempt at menstruation which goes no farther than engorgement and supersecretion of the uterine glands. White menstruation is not pathologic and certainly does not demand surgical treatment.

The ordinary menstrual fluid is composed of mucus, which comes at first from the uterus alone; at a later stage the vaginal glands are also active and pour out their share of mucus. At an early stage blood is mixed with this mucus, and the fluid takes on the tint of venous blood, or by rapid decomposition of corpuscles it becomes brown or black. Ciliated epithelium from the uterus is abundant, and a small quantity of epithelium from the vagina is also present. Remains of the endometrium are to be found abundantly. Fatty acids are present to give to the fluid its characteristic odor, and to prevent the coagulation of the menstrual blood. When the blood is present in high proportion, possibly because of a low amount of mucus and acids, clots form, to the dismay of the subject. Of all the components of the menstrual fluid the blood is probably the least important. The hemorrhage is merely an untoward accident occurring in the course of important significant changes within the uterus.

That menstruation is an excretory process during which "bad blood" and nameless poisons are excreted is an error possessed of notable vitality, for it has lived long and it dies hard. No one has suggested a mode or an avenue of elimination for this poison in men, boys, old women, pregnant women, little girls, or women in whom surgery has brought on an artificial menopause; no one has detected it in the discharges; no one has pointed out any essential difference between women who menstruate freely and those who menstruate scantily. Nevertheless, the fancied peccant substances will remain in literature for another century.

I know of courtesans enjoying excellent health who, with more knowledge of their trade than of transcendental pathology, have learned the trick of *suppressing the menses* at will by the use of tightly packed sponges. A. W. Parsons, of Northhampton, Mass., has taught many patients to tampon the vagina, partly for the comfort and neatness secured and partly to limit the amount of discharge, as might be thought good. In 1888 Gehrung (*American Journal of Obstetrics*) recommended the use of an alum-soaked tampon to be retained for forty-eight hours unless there should be leaking through or around it. He uses this tampon boldly to abbreviate or lessen the flow at his pleasure or to hasten the menopause. It was his deliberate purpose to reduce the flow to a limit of from 2 to 4 ounces, and this was accomplished in his therapy without a hint of harm. Loewenthal, in June, 1888, advocated the restraint of menstruation by intrauterine injections of hot water, or occasionally of iced water. He had greatly benefited 18 cases of chlorosis by suppressing menstruation for from three to five months.

THE INDUCING CAUSE OF MENSTRUATION

Then, throwing aside the notion that the menstrual fluid is cast out by an active effort of the system to rid itself of a poison or a group of poisons, we inquire further into the inducing causes. From the very beginnings of medical literature there is a hint that the blood of the human female was rich enough to force an overflow every four weeks, this capacity for plethora being born and bred in her for the benefit of her possible offspring. Without a fact to support it, this teleologic theory was unchallenged until late in the present century. More recently a very popular theory was that Nature prepared a decidua for the coming ovum, and that, when impregnation failed for any cause, she entered upon a house cleaning process which involved the casting off of the decidua, and, as Christopher Martin said, poured out a flood of blood from the turgid capillaries to wash away the useless débris.

Of late some have been strangely impressed with the fact that the uterus has a rich nervous supply, its sympathetic fibers reinforced by spinal filaments given off from the abdominal splanchnics, which send filaments to the uterus by way of the hypogastric plexus, and reinforced also by fibers from the pelvic splanchnics, which also pass through the hypogastric plexus on their way to the generative organs, the bladder, and the rectum. It has caused admiration, also, that the uterus has its own ganglia, giving it independent movement, even when dissevered from the body, and it has been announced that the uterus has anabolic nerves to retard and katabolic nerves to accelerate its metabolism.

But in all this the uterus is not singular; its nervous organization is in every way comparable to that of other important viscera, for we believe that they all have motor, sensory, vasomotor, and trophic nerves. That the function of menstruation involves nervous apparatus is true, by all analogies, but that it is in any special sense a nervous phenomenon is not true.

Ott has shown, as have many other observers, that there are slight changes in temperature, pulse, blood pressure, and respiration through the menstrual cycle, and that, carefully followed, these indicate that vital activity is at a maximum just before or during menstruation. Gathering up the large array of facts that show these trivial changes in vital processes, and show also that the daily excretion of urea and of carbonic acid is subject to slight variations through the menstrual cycle, Stephenson has held that the wave of rising vitality is influenced by a menstrual center, wholly hypothetical as yet, which is, or ought to be, situated somewhere in the lumbar portion of the spinal cord, and which acts rhythmically to bring on Stephenson's wave and the accompanying menstrual flow. No explanation has yet been offered for the rhythmic action of the supposed center. The advocates of this theory of menstruation are troubled little by the fact that similar waves are to be detected in the lower animals and in the males of our own species, and the doctrine may well be dismissed in the words of Stephenson himself, who reduced the whole theory *ad absurdum* by his comment on the varying intensity of vital phenomena in the male. "It is, therefore, evident that the phenomena belong not to the function of menstruation, but to a general law of vital energy."

A case of Rushton Parker's may here be quoted with profit. He was consulted by a couple who had been married eight months and had never accomplished coitus. The husband was twenty-four years old, and nothing could be seen amiss with him, save that he had "a cowed look." He denied any practice of masturbation, and also denied any sexual feeling. All organs were normal, save that the testes were small and soft. His wife had observed that he had a sanguineous discharge for three days out of every month. He readily agreed to a separation and a division of income.

Napier has suggested that the pressure of the enlarged utricular glands of the endometrial mucous membrane may be the stimulus acting upon the terminal nerve filaments to induce menstruation, and he has pointed out the fact that the time required for such growth in the constantly renewed mucous membrane would correspond rudely with the intermenstrual period.

But we need not look for any accurate, mechanical explanation of this function. We can do no better in the present state of our knowledge than accept menstruation as a habit which has been nailed upon our race by heredity, and which is for us an ultimate biologic fact. This hypothesis meets all cases of menstruation without ovulation, all cases of menstruation after the removal of the pelvic genitalia and the destruction of their nervous apparatus, all cases of menstruation in infants and in withered old women, all cases of menstruation in men, and all cases of vicarious menstruation.

THE ROLE OF THE UTERUS IN MENSTRUATION

It is often said with essential truth that "menstruation marks the destruction of the endometrial mucous membrane." If it does not do all this it certainly marks the destruction of its highly organized, thickened superficial part, the decidua menstrualis. The endometrium is a mucous membrane highly specialized, to be sure, but not more so than the mucous membrane of the intestines and the stomach, and it certainly does not depart from the type so far as does the conjunctiva. It is distinguished anatomically by its delicate stroma and by its abundant glandular elements; it is distinguished physiologically by its power of self-renewal which recalls continually the fetal tissues, the cells of malignant growths, and the tissues of the crustacea and lowlier forms of animal life. Delicate as it is, it is not thinner but thicker than most mucous membranes during the greater part of the menstrual month. It is essentially a uterine lining, for it does not extend downward into the cervix, or into the Fallopian tubes. At or before the menstrual time it undergoes fatty and granular degeneration and is cast off in great part, and, when discarded, it leaves the blood vessels in its basal substance unsupported. That the whole mucous membrane is discarded is not believed; regeneration is accomplished by the remaining glands in the deeper layers, and is complete in about ten days after the general wreck has been effected.

These facts have been derived from the studies of many observers, but unfortunately they have been somewhat vitiated by the post-mortem delay in preparation of specimens, or by the impress of lethal accident or disease. For this reason we turn to our quadrumanous sisters and follow the admirable epitome of Walter Heape's labors, prepared by Lawrence for the Ohio State Medical Society in 1897. It will be understood that the researches cover the studies made upon the lowly *Cynomorpha,* but mostly upon the higher group of *Anthropomorpha,* which includes the lemurs, chimpanzees, orangs, and the gorilla.

Heape divides the menstrual cycle into four stages: (1) rest, (2) growth, (3) degeneration, (4) recuperation.

During rest there is only one layer of cubical columnar cells, with round nuclei. The protoplasm of cells is continuous with the protoplasm of the stroma network beneath. This epithelium is continuous with that of the glands beneath. The stroma has round nuclei imbedded in a continuous network of protoplasm.

During growth the stroma nuclei are much increased by amitotic division and by fragmentation; this causes swelling of the superficial portion of the mucosa. Nuclei now become fusiform. Deep portions of stroma are not changed. Interglandular tissue swells, but the glands are not much altered. The epithelium, lifted by the dense layer of nuclei, becomes less dense. The blood vessels below the epithelium undergo hyperplasia. The more superficial layers of the stroma swell. Glands are widened. Many stroma nuclei are reduced in size, but the mucosa as a whole is increased in thickness.

During degeneration there appears hypertrophy of the epithelium, the stroma, and the walls of the blood vessels. Afterward there is amyloid degeneration of the superficial layers of the mucosa. In this layer congested capillaries break down with extravasation. At each point of rupture red and white cells are swept into the stroma. The extravasated blood collects in lacunæ in the stroma, and these lacunæ, extending and dissecting, lift the epithelium. At this time the deep portions of the mucosa are not infiltrated, and neither red nor white cells are found free. Leukocytes and stroma cells degenerate; the epithelium shrivels; lacunæ grow larger; degenerated epithelium is ruptured; blood is free in the uterine cavity. If in any case the lacunæ surround a gland the gland is washed away. In this later stage of degeneration leukocytes increase the number of their nuclei, but are not seen to divide. Denudation is now complete; all the epithelium, portions of glands, and sometimes whole glands, and even small portions of the stroma are lost in the flood. The inner surface of the uterus appears ragged, with layers of masses of blood here and there. The deep layers of the stroma are wholly intact.

In regeneration the epithelium is formed anew by extension from the torn edges or by the transformation of the stroma cells. New capillaries are formed and new blood vessels. New glands are formed by the infolding of epithelium. Extravasated blood is absorbed. Repair is complete; rest is at hand.

THE ROLE OF THE FALLOPIAN TUBES IN MENSTRUATION

It is positively known, by the dissection of women who have died by violence at different stages of menstruation, that the Fallopian tubes are much congested during menstruation, and that, in most cases at least, they are filled with fluid that contains blood corpuscles and epithelial cells. Robinson, of Chicago, after a study of 800 tubes from operative and post-mortem cases, confirms this, and expresses his belief that the ovum is more easily preserved and wafted through the tube while thus filled with fluid.

Besides what is known, it is certainly very probable that the congestion and contraction of the tube lead to its erection, and that during some part of menstruation it has a gross movement of peristalsis, while the cilia of its epithelium become active. That the tubes have much to do with the excitation which precipitates menstruation might well be supposed, from the fact that they are continuous with the uterus, and the additional fact that they have a nerve supply identical with that of the fundus. Tait says that 90 per cent. of cases will not even menstruate once after the removal of the tubes.

THE ROLE OF THE OVARIES IN MENSTRUATION

Some have admitted the theory, wholly fanciful in the present state of our knowledge, that the ovary is in part a ductless gland, and that its secretion, having accumulated in the tissues of the body to a certain saturation, becomes the proper stimulus for menstruation.

Waiving this doctrine, which is capable neither of proof nor disproof, we may say that the ovary has but one function, viz., ovulation, the production of ovules whose highest destiny is to be fructified in the Fallopian tubes and developed in the uterus.

It is a matter of regret that the term ovulation is a vague one. It is used commonly to comprise processes which cover much time, possibly months. We have reason to believe that it takes long for the young Graafian follicle to assert itself, deep in the stroma of the ovary, and still more time before it appears on the surface of the ovary as a mass of vascular loops, and yet more time before the wall becomes non-vascular, fatty, and friable, for the escape of the ovule. And even then, according to the notions of some, ovulation is not accomplished until the Fallopian tube receives the ovule and sends it to the uterus.

Making the term cover only the latter part of this long process, however, we put upon it a time limit of days rather than weeks, and come upon a wilderness of doctrines as to the relation of ovulation and menstruation.

It is held by Pflüger and his followers that menstruation is a result of a nervous discharge caused by the bursting of a Graafian follicle and the liberation of an ovule. Raciborsky found ripe or ruptured follicles in healthy and menstruating women who had met with sudden death, as did Leopold also, and their opportunities for investigation were ample. Unfortunately for the theory, they also found many ripe follicles unruptured. Walter Heape puzzles us by a statement that in *Macacus rhesus* the breeding season is strictly limited, but that menstruation continues regularly all the year around. Out of 16 cases he has found a recently discharged follicle in only 1 case. He has not seen a clot in a follicle in any case. His researches on *Semnopithecus* agree with these observations, and lead to a conclusion that ovulation and menstruation have no relation in these species. Leopold's studies were made upon twenty pairs of ovaries of women whose menstruation was recorded, and he could only say that rupture took place most frequently at menstrual periods, but might occur at any time.

It is held also by some that the passage of the ovule through the Fallopian tube is the immediate stimulus for menstruation. This is not inherently impossible, for, as we have remarked, the nervous and muscular anatomy of the tubes makes them almost one with the menstruating organ, the uterus. But we are barred from dogmatism here by our ignorance of the duration of the transit of the ovule through the tube, for the authorities vary in their estimate from one day to eight days.

We do not even know whether the escape of an ovule from the ovary and its journey to the uterus precede or follow menstruation. Naegeli taught that the ovum could live in the newly prepared uterus for some time after menstruation was completed, and that, failing to be fertilized, it was cast off with the decidua at the next menstruation. Loewenthal's doctrine is not far from this, for he teaches that the ovule always imbeds itself in the endometrium and stimulates the formation of the decidua menstrualis; at a later date, if still unfertilized, its death brings about that congestion which ends in menstruation, though he holds all hemorrhage to be accidental and pathologic. Barnes also taught that the unfertilized ovum, of some considerable age, is cast off with the decidua menstrualis, but he conceived the plausible idea that there was habitually another ovule on the road to the uterus at the time of menstruation.

This jungle of theories will not be cleared until we master fundamental facts which at present are beyond us. We need first to collect all the ovules which pass from a woman, but their fragility and their microscopical dimensions will forever forbid such investigation. We need, secondly, to be able to read the record of ovulation which is left in the corpus luteum; but Cohnstein is not alone when he declares that we have no means of estimating definitely the age of one of these bodies.

We are, therefore, obliged to return to the principle enunciated in a former section, and to say that menstruation is a habit of the female organism, inherited and fixed beyond her present needs, and to that we add that ovulation may occur at any part of the menstrual period cycle. Avoiding any more definite creed, we are not dismayed by the following anomalous cases, which are entirely inexplicable in other theories of menstruation and ovulation.

In girlhood, and even in childhood, ovulation is active without menstruation, and is sometimes attested by pregnancy before the menses have appeared. Robinson says that an examination of 800 ovaries convinces him that ovulation begins before birth and continues into old age.

Conception, implying ovulation, occurs in many nursing women who do not menstruate.

Menstruation occurs in some exceptional women only during pregnancy.

Menstruation occurs exceptionally after the removal of the ovaries.

Girls and other young mammals have ovules even at birth, long before the period of menstruation.

De Sinety found a fresh corpus luteum in a young woman who had died of phthisis, though she had not menstruated for many months. Vermeil and others have reported similar cases.

It is known that some women who have long passed the menopause ovulate.

In rare cases women who have ceased to menstruate become pregnant.

THE HYGIENIC MANAGEMENT OF NORMAL MENSTRUATION

The primitive man looked upon his genitalia and those of his mate with worshipful regard, first as a fetish and later as an incarnation of the creative principle in nature. Most women, and even some men with microscopes, have failed to outgrow this savage theology, and upon small knowledge of the genitalia have grafted an incredible mass of barbaric superstition and crude folklore. More or less vaguely women hold to the belief that menstruation is a season of peril, and the general drift of the best teaching is to the erroneous opinion that menstruation is a pathologic process which must be skillfully guided to an end by the craft of the physician. It would be well if this had definite form, for then it would become vulnerable and absurd; as a matter of fact, it survives in misty form in the subliminal consciousness of the race, beyond the reach of logic or persuasion.

Menstruation being a perfectly innocuous, physiologic process, it may be said that the hygiene of menstruation is the hygiene of all the year round. The woman who conserves her general health and maintains herself in the highest possible vigor has done all that can be done to make menstruation safe and easy.

In negation we will say that there is no need for putting the young girl to bed during her first few periods, and still less excuse for putting a poultice on her, as a distinguished author has recommended. Clothing should be changed at need, in spite of the protests of old women; and there is never so much need of a daily sponge bath as during the menstrual time. The salutary truth that filth and health do not agree should be pressed upon the young girl and upon the older woman who complains of an ill-smelling menstrual discharge when, in fact, she is offensive from the rancidity and putrescence of axillary secretions. The fishermen's wives in Europe, the bathing attendants at the seashore, and the patients at water-cure establishments are not, in general, permitted to abstain from contact with water at the menstrual time, and they are not aware of any great harm resulting from the exposure.

In the early stages of Raynaud's disease, Basedow's disease, phthisis, chlorosis, and a number of forms of anemia amenorrhea is an early symptom. In the late stages of disease the wretched female patient often looks back over her career and recalls to memory some one of the traditional causes of suppression—a bath, a drenching, or what not—and with poor logic she connects the exposure, the suppression, and her ruined health in a causal chain. Experience, the fruitful mother of all error, has its preconceived theory; it marks the hits; it forgets the misses; it perpetually confirms the error with which it began. And so it happens that the greater number of women are, at the menstrual time, fearful of harm when they make a toilet for the skin, or put the hands in cold water, or walk, or ride, or dance, or do a thousand things which are considered proper and safe during the intermenstrual period.

The list of complications which are said to go with menstruation is one which might be safely attributed to a group of men. It includes constipation or diarrhea, subjective sensations of heat or cold, increase or diminution of urine, anorexia or craving appetite, increased activity of the sudoriparous glands, pigmentation of the skin, yawning, cramping, hiccough, meteorism, palpitation, and irritable temper.

For a short period at the very height of menstruation the bodily temperature is elevated about half a degree. In very impressionable persons this causes a slight feeling of lassitude. A certain slight dragging sensation, a feeling of weight in the legs, and a definite though slight pain in the sacrum, groins, and thighs often cause menstruating women to take more than their usual repose. It would not be wise to induce such women to exercise violently; neither, on the other hand, is it wise to coddle them and cultivate valetudinarianism.

CHAPTER II

MENORRHAGIA

Menorrhagia is an excessive flow from the uterus at the menstrua time. Only its periodicity distinguishes it from metrorrhagia.

CAUSES OF MENORRHAGIA

We can hardly conceive of hemophilia as a cause of menorrhagia Women transmit this defect of constitution, but the disease is so manifestly incompatible with menstruation that Nature has long since stamped out the tendency to hemophilia in the female.

General Systemic Causes of Menorrhagia.—(a) In *purpuric conditions* we have a strong tendency toward menorrhagia, for in this disease the blood is altered in such wise that it has a manifest tendency to transudation, and a loss of its normal coagulability. Menstruation opens the door and the flow is excessive.

(b) In all forms of *anemia* we have a relatively great amount of water in the blood, a relatively diminished amount of albuminoid substances, and diminished coagulability. Chlorosis, in this regard as in many others, stands apart from the anemias, for it tends to scanty flow, if any.

(c) In *plethora* the increased flow is due to high arterial tension rather than to a morbid condition of the blood.

(d) In the different *chronic forms of nephritis* we have an altered condition, first of the blood, and later of the blood vessels, both disposing to hemorrhage.

(e) In *malarial poisoning* we have the bleeding tendency well marked, not alone in the uterus, but also in the rectum, bladder, and nose.

(f) In any form of *debility* menstruation is apt to run into excessive hemorrhage from inability to promptly repair the endometrium.

(g) In the *specific infectious diseases* we have reason to believe that hemorrhage is often excessive by a combination of depraved blood, altered blood vessels, and the debility of an organism that is too busy with the disease to make repairs in the uterus.

Local Diseases above the Pelvis, causing Menorrhagia.—(a) *Violent emotion* has often been known to increase the menstrual flow, even to the danger point. We are obliged to assume that it causes vasomotor paralysis.

(b) In *cardiac disease* with venous stasis extravasation is invited. Stagnant blood, dammed back in the veins by an inefficient heart, seeks a place of least resistance, even in the male patient. In the female the place is indicated plainly once a month.

(c) *Pulmonary disease* may run such a course as to obstruct the pulmonary circulation early, thus wearing out the right heart and leading to venous stasis. Ordinarily the early course of the disease is toward amenorrhea, or scanty menstruation, and the blood is rich in the coagulating principle.

(d) In *hepatic disease* the return of the blood from the uterus is impeded, and there exists in jaundice the hemorrhagic tendency which is the plague of the surgeons.

(e) In *splenic disease* also there is some obscure alteration of blood or of blood vessels disposing to hemorrhage, as in uremia. All these causes of menorrhagia are rare, however.

(f) In a given number of cases of *abdominal tumor* we shall find a great number of cases of menorrhagia due to pressure of the great venous avenues of return of blood, and to the perturbing influence of pressure on the uterus.

(g) Yet the commonest cause of menorrhagia, after all, is the *fecal tumor* so often present in the female patient. It, like any other abdominal tumor of its size, operates viciously by compressing venous trunks; it presses upon the uterus and directly irritates the organ; it is liable, through the sympathetic system, to irritate the nervous apparatus of the uterus, and increase its arterial supply; by its downward pressure it aggravates every flexion and version; it slowly establishes a condition of stercoremia and hydremia; it breeds a tympanitic tumor in addition to the solid fecal mass, and thus still more increases pressure.

Pelvic Causes of Menorrhagia.—But for the etiology of menorrhagia we look most to the bleeding organ itself, and to its neighbors in the pelvis. The uterus and tubes are anatomically continuous and virtually inseparable by dissection. These organs and the ovaries have a common nervous supply. The whole trio is fed by only two pairs of arteries, and their veins are few and simple. It is, therefore, inherently probable, and it is clinically proved, that irritation or inflammation of one of these organs must lead to exalted function of the other two.

Passing to the uterus itself, we note that one of the most common causes of menorrhagia may be found in the *subinvolution of the uterus* after abortion. Subinvolution may occur after delivery at full term, especially if it is not followed by lactation.

In the condition known as areolar hyperplasia, sometimes reckoned a true *chronic corporeal metritis,* we have a flabby, atonic state of the uterus, with enough inflammation to determine much blood to the uterus and to limit its power of repair after the menstrual wreck.

Inflammation involving the endometrium tends to produce menorrhagia, and this tendency is especially well marked in the cases where large granulations are produced on the interior surface.

Healed *lacerations* of the cervix and deep *ulcerations* at the same site sometimes seem to be starting points for an irritation that disposes to an increase of menstrual blood.

In malpositions of the uterus we have often the greatest irritation leading to increased blood supply. In some of the malpositions the veins of the broad ligament become varicose from distortion and long-continued pressure. The blood returning from the small vessels of the endometrium passes into the uterine sinuses, and thence toward the heart by way of the veins in the pampiniform plexus, and it is evident that any limitation of the carrying power of the veins of this plexus will produce some degree of stasis in the uterus.

Uterine tumors also act in this double manner to cause menorrhagia: they vastly increase the normal irritation of the uterus, and they act in a mechanical manner, by pressure or by dragging, to block the veins of the broad ligament. Subperitoneal tumors do less harm than those which lie in the wall of, or under, the endometrium. After *incomplete abortion,* when some portion of placental tissue remains rooted in the endometrium, the menstrual flow is sometimes enormous. The irritation is out of all proportion to the size of the offending body. Malignant disease of the uterus often leads to menorrhagia at an early stage. Sometimes the menorrhagia has no provoking cause that can be detected. The theory of congestion is then invoked to cover our ignorance. Reincke and others have of late years developed the fact that in some cases of menorrhagia the uterine arteries are sclerosed, prematurely old, prominent, and incapable of contraction. They carry a maximum of blood and necessarily tend to menorrhagia.

TREATMENT OF MENORRHAGIA

When menorrhagia is due to plethora the tendency is toward automatic palliation. Later the volume of the blood may be diminished by purgatives, exercise, and restricted diet.

In all forms of hydremia the treatment must look to restoring to the blood its nutrient principles, and especially its saving power of coagulation. In the very time of menstruation every means of limiting the discharge should be used; for each hemorrhage, by impoverishing the blood, invites a more profuse and prolonged hemorrhage. The bowels should be kept open without purgation. The subject should lie rather than sit. The feet should be warm day and night. In urgent cases the tampon should be applied in such a manner as to correct any malposition of the uterus, and it should make firm pressure on the cervical tissues. Since it is not the object to coagulate the blood in the vagina, no styptic substance should be used. The tampon should rather be treated with some antiseptic substance, like boric acid, which is only slightly toxic, is inoffensive, and has a faint acid reaction, to avoid neutralizing the normal acids of the vagina. In extreme emergencies the uterus might well be flushed with hot water at 110° to 115° F., under asepsis and with free return of fluid secured. The emergency passed, the attempt should be made to improve general nutrition and to enrich the blood. The milder scale preparations of iron have great value for prolonged use. In the presence of a brisk hemorrhage the tincture of the chlorid of iron is of most value. The common impression that iron increases an existing hemorrhage has no basis in fact. Arsenic is of great value in anemia, and may well be alternated with iron.

The debility which leads to menorrhagia is often based on some hemic defect. It will often demand a blood count and estimate of hemoglobin, with a study of excreta for a comprehension of its causes.

Menorrhagia complicating the acute infectious diseases is seldom severe or long continued. In the exanthemata it usually declines with the development of the cutaneous eruption. In scorbutus treatment must be addressed chiefly to the underlying disease, and that treatment is dietetic. In menorrhagia resulting from nephritis the treatment must reach the underlying disease also. In malarial cases treatment for the toxemia will accomplish brilliant results, even in an emergency. The chief danger in menorrhagia is that the physician will, with mind prepossessed, seek for a cause in the pelvic organs and overlook some profound disease or dyscrasia. Menorrhagia caused by great disturbance of the emotions should be treated by palliative measures at first. The menorrhagia, curiously enough, tends to repeat itself for a few months. When this affection is a result of cardiac or of pulmonary disease it needs virtually no treatment save that which is directed to the relief of venous stasis. In pulmonary disease the ultimate tendency to amenorrhea will be an aid. When menorrhagia complicates hepatic, splenic, or renal disease the treatment is mostly palliative, while the fight is made upon the causal disease. In advanced stages, when a cachexia has been established, menorrhagia is rarely a complication. The treatment of abdominal tumors is a matter of surgery, not to be considered in this chapter. The treatment of fecal tumors is of the greatest importance and may be here discussed. They should be swept out by repeated doses of purgatives. In severe cases it may be necessary to aid purgatives by enemata or by tunneling through hard masses in the rectum. If it is known that there is no obstruction calomel may be given in an efficient dose, combined with podophyllin, or any of the more powerful vegetable purgatives. For initial purging the salines may suffice. They have a special value in their power to cause a free osmosis into the intestinal tube, reducing incipient inflammation and putting an end to the absorption of poisons from the intestine into the blood. Repeated enemata, each measuring half a pint, of a saturated solution of magnesium sulphate, retained as long as possible, will often produce great results and save the patient the annoyance of large and repeated doses of medicine *per os.* When the bowel is well emptied it is important to keep it empty to the physiological limit. Radical and abrupt changes in diet will have some effect, but very little, in the average woman of constipated habit. The laxative power of fruit is a fiction from Paradise. So long as it is a novelty oatmeal is sometimes an efficient laxative, but the system is soon habituated to it. Mustard seed or flaxseed, swallowed without mastication, is oftentimes very efficient. Senna, the basis of most of the secret purgative and laxative teas and syrups, is to be commended in small doses for a limited time. As an alternate medicine cascara sagrada is most excellent. The intestines rarely become habituated to this medicine. Atropin and strychnin seem to have some effect in breaking up constipation.

It has long been taught that a sharp purgative, preferably a mercurial, given a short time before menstruation has a distinctly curative effect in some cases. The treatment should be kept up for some months. It may be conceived that the benefit is accomplished by depleting pelvic viscera, diminishing a mild metritis, and exercising a tonic nervous action on the uterine blood vessels.

Supposing the bowels to be in good order, one may resort to ergot and its allies, ustilago and gossypium, with a hope of permanently contracting the fibers of the uterus and the muscular fibers of uterine and ovarian arteries. The liquid preparations of these drugs are so bulky and offensive that tablets of ergotin are to be preferred. The treatment is of no avail in emergencies, but under ordinary circumstances should be maintained for one or two months at least.

Excellent results will sometimes be attained by giving potassium iodid for ten or twelve days previous to the menstrual time. The dose should rise as rapidly as tolerance will permit from 10 to 40 grains per diem, and be there maintained until the second day of menstruation. Apart from any obscure "alterant" action, the drug produces its benefits through known channels. It has a power of dilating systemic arteries and lowering arterial tension; it improves the nutrition of the heart, in many cases, by its direct action on heart muscle and by its action on the coronary arteries; it cures bronchitis and bronchitic asthma and moderates the complications of emphysema, thereby lightening the labors of the right side of the heart and diminishing venous stasis; it palliates concealed syphilis. For prompt and evanescent action as artery dilators alcohol and the nitrites may be used. Digitalis has no place in the routine treatment of menorrhagia. It is only indicated in cases where the hemorrhage is caused by some cardiac disease demanding the drug.

The use of styptic substances *per os* has no other justification than a credulous hope that the stomach may be induced to take up so much of the drug that the blood will be saturated to a degree sufficient to check undue hemorrhage at a distant point. Quinin, strychnin, and atropin have no direct effect upon the hemorrhage, but have great value when it is desired to whip up circulatory or respiratory centers, or the lumbar centers which send fibers through the hypogastric plexus to the uterus and its appendages.

In rare cases, supposed to be caused by ovarian irritation, the bromids will diminish the menstrual flow. They certainly tend in the main to diminish the flow, and, as Ernst of Vienna has pointed out, to increase the interval between menstrual periods. Whether, for the benefit reached, it is well to blanket the whole nervous system with a depressant drug is a question.

Electricity has doubtless a place in the treatment of menorrhagia, though it will be the resource of the few. The positive pole in the uterus carrying a galvanic current has an admitted hemostatic effect, the current being cautiously raised to from 30 to 50 milliampères. Later, in the absence of hemorrhage or inflammation, the current may be much increased. In any case a cure can not be expected under a treatment extending over months. In emergencies the current used in the interior for hemostasis may be raised to 150 milliampères, and it must be understood that it is then positively cauterant. Strict antiseptic technique must accompany this treatment.

Desperate cases of menorrhagia may require the induction of the artificial menopause by the aid of the surgeon.

CHAPTER III

METRORRHAGIA

Metrorrhagia is a hemorrhage from the uterus in the interm strual period.

There was when menorrhagia and metrorrhagia were [illegible] [illegible] that all [illegible] flows from the uterus [illegible] essentially hemorrhages [illegible]. When we meet with a metr rhagia which begins in an intermenstrual period, continues with cessation through a menstrual period and so runs on for we we perceive that [illegible] between the two affections, or if we consider a case of early menorrhagia which each month lingers on through the intermenstrual period to become at last an unintermitt flow, we must admit that our classification is artificial and a matt of mere words. The reader is therefore referred to the [illegible] section for the causes of metrorrhagia in general, since these inte hemorrhages are not [illegible] [illegible] in their etiology.

Metrorrhagia in early life almost always points to anemia, in particular that anemia which is [illegible] referred to elsewhere.

In young married women metrorrhagia should excite suspicion of incomplete abortion. In such cases curettage should be done af the method [illegible] in another part of this work. The mechan [illegible] of the [illegible] of an incomplete abortion has the added a [illegible] that it gives opportunity to [illegible] the [illegible] [illegible] [illegible] [illegible] of endometritis which [illegible] as a result of abortion or [illegible]. The operation al clears the diagnosis [illegible] formation of intrauterine tumors.

In [illegible] metrorrhagia, much more than menorrhagia, shou [illegible] of uterine cancer. Such subjects, approaching t [illegible] [illegible] upon an intermittent flow as a sim sign [illegible]. They know that pain and fever belong to ca [illegible], and having no knowledge beyond this, they pass, still in go general health, beyond all possibility of surgical aid. In the prese state of our knowledge it would be well if every case of metrorrhag in women past thirty-five years were held to be a case of cancer un the contrary was proved. In the absence of a visible and tangible ma of malignant growth the physician should still hold doubts as to small adenomata of mucous glands of the endometrium. In 2,200 cases of metrorrhagia Baer found 41 who had malignant disease of the uterus. Only 3 of these were younger than thirty-five years; only 5 were older than fifty-five years; 26 of them fell in a group in the years between forty and fifty-five years of age.

Metrorrhagia is sometimes maintained by a sclerosis of arteries, as in the case of menorrhagia. Leopold in 1896 made 4 extirpations of the uterus in women who had borne from 4 to 12 children, and found the uterine arteries large, tortuous, thick, and gaping. The vessels projected above a cut section. The thickening was of the median layers, the intima not being affected. The extirpations were made for suspected malignant neoplasm. Curetting had been of no avail and ergot had appeared to increase the hemorrhage.

When the floor of the pelvis has been broken down, with great damage to the levatores ani and to the rectovesical fascia, metrorrhagia is likely to follow in the course of years, and to be so intractable that surgical treatment only will avail.

Treatment of Metrorrhagia.—The *general principles of treatment* laid down for menorrhagia apply here. In metrorrhagia intrauterine applications will work a cure in a larger proportion of cases than in menorrhagia. The cervix being sufficiently dilated, iodin in solution; phenol, pure, diluted, or combined with iodin; creosote in solution, or tannic acid may be carried up to treat the entire endometrium with the hope of diminishing succulence or atony, or of reducing inflammation. The solution of these and other styptic and cauterant substances is often made in glycerin, and that solvent, by virtue of its great avidity for water, is able to deplete the endometrial tissues and new growths.

CHAPTER IV

AMENORRHEA

Amenorrhea is not a definite disease, or even, in all cases, a symptom of disease. By the term is indicated merely an absence of menstruation. Amenorrhea may be physiologic, as in nursing women and in pregnant women, or it may be symptomatic of some wasting disease.

An interesting group of women appear to be perfect in their development, and yet never menstruate. Not all such women are sterile, though conception is excessively rare among them. I have knowledge of one such case, a woman who has been happily married for twenty years. Hubbard Winslow Mitchell reports an Irish immigrant, well developed as to genitalia and breasts, who had never menstruated. Withrow, of Cincinnati, has reported the cases of two sisters and the daughter of another sister who had never menstruated. All three of them had enjoyed the sexual relation and all were sterile. Two of them had profuse periodical epistaxis.

It would appear that this condition of amenorrhea may be acquired, as in the notable case reported by Petit, in which the woman of twenty-one years was found with a child between her thighs, an inverted uterus, and an adherent placenta. Reduction was accomplished, and, after a tedious convalescence, she was restored to health in the course of eighteen months. Although she bore a child after two years and a half, another in sixteen months, and her fourth child after six years, she never menstruated and never had leukorrhea.

In most cases of lifelong amenorrhea something teratological appears. Thus, Walter B. Chase recorded the case of a woman of good physical development who had the menstrual molimina every twenty-eight days from the age of eighteen; she married at twenty-two years, and came under his notice at twenty-four years of age. She had been sterile through two years of married life. Her periodical pain was unbearable, and insanity was feared. Her abdomen was very fat, but tumor was diagnosticated. Operation revealed a thin-walled sac subdivided into cavities, of which some were and some were not infected, and a teratoma containing sebaceous matter in emulsion, hair plates, and bone. No Fallopian tubes were found. A small amount of ovarian tissue was flattened on the wall of the multilocular cyst, with an imperfect corpus luteum. Manton reports a woman of twenty-two, married three years, who had never menstruated, but for four or five years had suffered periodically with abdominal cramps, severe headache, and occasionally tender and swollen breasts. She had no vagina, but the husband's perseverance had made at the fossa navicularis a pouch 3½ inches deep, leading nowhere. Rectal examination with a sound in the bladder showed the ovaries in proper position, but no uterus could be found. Manton has seen a girl in a similar condition. She seemed to enjoy such "intercourse" as was possible to one who, in lieu of a vagina, had a cul-de-sac of a depth of only 2 inches. Herbert C. Jones, of Decatur, Ill., gives an account of a woman of size and stature above the average, who consulted him as to a vaginal discharge. She had never menstruated. He found that she had a capacious vagina, a large hooded clitoris, a uterus three-quarters of an inch in depth, and no ovaries to be distinctly palpated. She had no mammæ, and her nipples were rudimentary. Her statement that sexual intercourse gave great pleasure was confirmed in a day or two, when it was determined that her discharge was from gonorrhea contracted the second year after marriage through illicit intercourse.

In young girls there is often a period of amenorrhea following hard upon the first one, two, or three menstrual periods. In most cases this failure is due to anemia.

Treatment of Amenorrhea.—Since amenorrhea is only a symptom, it can not in strictness be said to require any treatment. The treatment should be addressed to the diseases or dyscrasiæ of which it is symptomatic. The amenorrhea which comes to many young girls soon after menstruation announces itself should not be meddled with. It is a confession that Nature's first attempts were premature. The amenorrhea of some young girls is, however, a danger signal hung out to give warning of the earliest stage of phthisis. The treatment of the symptom is wholly included in the appropriate treatment of the disease.

Anemia should also be suspected in well-grown girls who have passed the usual age of menstruation. Most cases will be found to have dyspepsia as the underlying condition, and the dyspepsia will generally depend upon physical inaction, incessant nibbling without real meals, addiction to sugar, which, valuable as it is, will destroy the appetite and lead to fermentative dyspepsia, as girls use it and abuse it. Coffee-toping is a common cause of dyspepsia at this age. Whimsical appetites for ice, uncooked rice, laundry starch, uncooked prunes, and miscellaneous rubbish may often be detected by adroit questioning, and it will be found that these substances in many cases not only displace the regular meals, but lead to a positive gastritis, the pains whereof are interpreted as an all-day hunger to be satisfied only by the trash that bred it. The subjects of these whims are often fine, strong girls who will do well if they can be brought to take no food save at regular meals, with limitations as to coffee, sweets, and raw fruits. An astonishing number of girls are ignorant of the fact that the human stomach needs long periods of profound rest; the truth once presented to them by authority, they will often take the reform in their own hands with honesty and enthusiasm.

Constipation, or coprostasis, which in the older woman is sometimes the source of uterine hemorrhage, in the young girl very frequently produces such a degree of anemia as to suppress the menses. Many young girls are so loaded with fecal products that the breath has the odor of a night-cart. Here, again, ignorance combines with laziness or modesty to aggravate the condition. It is very easy to convince the average girl that it is a filthy and degrading deed to go about loaded with some pounds of excrement, and when that is done the case is half cured. Purgatives are not indicated in these cases. The formation of the syringe habit and the absolute annihilation of the rectal conscience is most deplorable. A course of laxatives, of which cascara is usually the best, combined with deep massage, rational physical exercise, and an immediate response to the rectal call, will not only get the bowel empty, but will go far to establish the habit of a daily evacuation of the bowels. Until the stercoremia has been corrected one need not attempt to correct other causes of anemia; when the bowels have been unloaded, and when the digestion has been amended, one should settle the question of the existence of albuminuria, malaria, syphilis, saturnism, splenic disease, or whatever dyscrasia may produce anemia in young subjects. When all cases have been sifted there will remain a residue of girls, and boys are not exempt, who, without apparent cause, develop the "anemia of adolescence."

For the medical treatment of this anemia the whole range of hematinic drugs may be invoked. Iron and arsenic are the chief of them. Manganese has acquired a reputation probably far beyond its deserts.

Apiol, an amber fluid obtained from parsley seeds, has been highly extolled by the French as being able to produce the menstrual flow. It is given in doses of from half a gram to a gram, and is said to be wholly innocuous. The use of oxalic acid in half-grain doses, given every four hours to three doses, is said to be very efficient as an emmenagog, but it is admitted that toxic effects have followed such treatment. All emmenagogs are open to an objection that they merely solicit a flow which ought not to be directly solicited, and which is sure to appear when the physiologic conditions of menstruation are present. This objection applies to the old and popular terebinthinate emmenagogs, and to those composed chiefly of essential oils.

It should, indeed, be a general principle of treatment that it is not worth while to bring on the menses, but rather to annul, if possible, the morbid conditions under which they disappeared. We have already noted the fact that there is a tendency toward amenorrhea in the presence of any notable hardship, and we shall be consulted perhaps when that hardship has passed away. Even a mere change that does not involve hardship will sometimes produce amenorrhea, as when a girl leaves the country and enters a factory, or *vice versa*. Curious cases are sometimes observed in which amenorrhea develops after marriage and persists for some months without pregnancy; and precisely reverse cases are observed in which amenorrhea comes with widowhood. These cases are inexplicable in the present state of our knowledge, and should not be rashly meddled with.

The same principle applies to amenorrhea developing in the course of exophthalmic goiter, Raynaud's disease, myxedema, and in connection with the sudden and grave development of fat. If we can amend the disease we are likely to cure the amenorrhea; if not the amenorrhea can do no harm.

RETENTION OF MENSES

In amenorrhea no menstrual fluid is produced. In retention the fluid is formed, but does not manifest itself externally.

For this seclusion there can be but one cause, viz., occlusion of the genital canal at some point (see Malformation of the External Genital Organs).

CHAPTER V

DYSMENORRHEA

Some rare cases of dysmenorrhea or painful menstruation appear to be a manifestation of a general neuralgic tendency due to general neurasthenia. The very wide distribution of the pain—abdominal, sacral, and crural—suggests to the mind the theory of a general nerve storm, and it is upon this theory we rest when we recall the anatomic facts that the nerve supply of the pelvic genitalia of woman is from the second, third, and fourth sacral nerves; that the sympathetic fibers come from plexuses which are virtually branches of the aortic plexus, and that the aortic plexus is virtually a derivative from the semilunar ganglion and renal plexus on each side. The genitalia are, therefore, connected by no remote strands with the cerebrospinal system and with all abdominal viscera, so that no great perturbation of the nervous system can occur without a disturbance of the genitalia. For pelvic pain at a menstrual time, bred by starving or irritated nerves in some remote part of the nervous system, the term dysmenorrhea is inappropriate, for it does not appear that the pain is due to menstruation. Menorrhalgia, proposed by Massey, is commendable in that it asserts pain and nothing more.

By far the greater number of cases are due to some morbid condition of the generative organs. Turning to the uterus, we note first that the infantile uterus with a depth of 2 inches or less, a conical cervix, and a pinhole os is often a painful uterus at the menstrual time. The only explanation offered for dysmenorrhea associated with the infantile uterus is that the filaments of spinal nerves imprisoned in the embryonic stroma of the imperfect endometrium are compressed during the menstrual congestion and subsequent changes.

After pregnancy, when the uterus normally shrinks from pounds to ounces, the involution sometimes passes all bounds and leaves the patient with what is, to all intents and purposes, essentially an infantile uterus by superinvolution. Here, again, we have dysmenorrhea, and are again tempted to theorize as to the replacement of muscle by fibrous tissue and the incarceration of nerve endings.

There has long been a tendency to ascribe menstrual pain to the pressure of fluid which, by reason of partial stenosis at the inner or outer os, or at some point of flexure of the uterus, has an imperfect exit from the uterus and induces pain by hydraulic pressure. The old masters had high controversy on this head. Hewitt said: "The large majority of cases are really cases of retention." Sims said: "There can be no dysmenorrhea, properly speaking, if the cervical canal be straight and large enough to permit a free passage of menstrual blood." The curative effects of cutting and stretching operations and the similar effect of parturition were held to confirm this doctrine. But, *per contra,* Matthews Duncan was prompt to contend that dysmenorrhea was always neurotic in its origin; he pointed out that the pinpoint os was large enough, as could be demonstrated on thousands of women; he urged that, in the absolute retention of menses, the pain was no greater than it was in many cases of dysmenorrhea with free exit; he held it to be significant that girls in their first menstruation did not usually suffer much; he showed that the women who suffered most had less flow than others; he demanded an explanation of the fact that there was no distention or sacculation above the alleged stenosis. Others reinforced him, declaiming that dilatation of the cervical regions cured dysmenorrheas only because the irritable fibers at that point were destroyed or paralyzed incidentally during the operation or during parturition. It was also shown that the uterine sound passed easily into the cavity during menstruation; that autopsies never showed stenosis at the site of a flexion; that the anguish was not extreme when in membranous dysmenorrheas the membrane acted as a valve, temporarily, and arrested the flow. Confirming this negative argument came Handfield-Jones, who declared that the os was normally open during menstruation, that it slowly closed in the next week, and was tightly closed in the week before menstruation. He ascribed dysmenorrhea to fibroid thickening, hyperesthesia, and muscular spasm at the inner os. Williams, of Cardiff, extended these views in part to the higher regions of the uterus, and suggested that the pain of dysmenorrhea might be caused by abnormal contractions set up by diseased mucous membrane at the site of flexure.

Those who hold out for the obstruction theory admit that in flexion of the uterus there may be no stenosis demonstrable in the post-mortem specimen, but hold that, with the ante-mortem thickening and congestion, there may be a decided obstruction in life which no autopsy can reveal. The observation of Da Costa that a flexion with a regular curve rarely causes obstruction, whereas a sharp bend does produce obstruction, is important in this connection.

Waiving all questions of the causal relation of obstruction, it must be admitted that a vast majority of cases of dysmenorrhea are associated with anteflexion. It is very probable that this deformity is caused chiefly by an arrest of development in the anterior wall of the uterus, and a portion of the pain of menstruation may be due to causes which produce dysmenorrhea in the infantile or undeveloped uterus.

Displacements of the uterus are associated with dysmenorrhea, but not so frequently as flexions. It is a question whether the pain is produced by direct dragging on nerves or by an interference with the circulation at a critical time, or by setting up inflammation in the uterus or its appendages with adhesions.

Uterine tumors produce dysmenorrhea. The general rule is that the more peripheral tumors, as subperitoneal fibroids, set up less disturbance than those which lie nearer the endometrium.

Metritis and endometritis are common causes of dysmenorrhea. In its normal condition the endometrium is almost, if not quite, as insensible as the cartilages and serous membranes, but, like these structures, it becomes exquisitely sensitive when inflamed. There is in health a certain sensitiveness at the internal os, giving the patient usually some uneasiness, or exciting strong reflexes when the sound is passed over this region; in inflammation this sensitiveness is exalted into a capacity for excruciating agony at a touch. Metritis and endometritis interfere with every step in menstruation; from the beginning they cause pressure on pelvic vessels and nerves; the capillaries in the deep stroma become excessively congested and prematurely tear the epithelium away; the inflamed glands crowd and compress each other and retard amyloid or hyalin degeneration and hyperplasia welds the deep and superficial stroma beyond the possibility of normal degeneration or regeneration. With all this irritation we can not doubt that the uterine ganglia will become irritated, setting up contractions of muscular fiber which shall be either wholly abnormal or preternatural as to intensity. Handfield-Jones and others have shown the probability that there is, in all cases of menstruation, a certain initial dilatation of the inner os, as at the beginning of labor before pressure or active dilatation has begun; if we grant this we shall doubtless have the intermittent pains of the softening process aggravated many fold by the metritis or endometritis.

The connection of tubal disease or deformity with dysmenorrhea is based upon very strong probabilities. The evidence is chiefly that the tubes are muscular; that they have motor ganglia capable of causing rhythmic motion in the tubes, even after their severance from the body; that dysmenorrhea is common among women who have salpingitis; that it is intense when a tube is obstructed at the uterine junction; that the tubes are continuous with the uterus and have the same nervous and vascular supply, and that they participate actively in normal menstruation.

Dysmenorrhea from oöphoritis is wholly denied by some, who say that the pain is merely referred to the ovary by the sufferer, when, in fact, it originates elsewhere. Nevertheless, there are very competent observers who have blamed certain severe cases of dysmenorrhea on the ovary by a process of exclusion. Dysmenorrhea is sometimes found to be associated with large, painful, easily palpated ovaries, so irritable that pressure upon them causes pain and nausea.

The study of chronic alcoholism in the female is sometimes confirmatory of the doctrine that inflammation of the ovaries may produce dysmenorrhea; for dysmenorrhea is often set up in heavy drinkers as a new symptom about the time the ovaries become large and tender.

Treatment of Dysmenorrhea.—No hope of relief for dysmenorrhea caused by an infantile uterus could be extended if the uterus were not unique among the adult tissues in its marvelous degeneration and regeneration. It has happened repeatedly that that which has been correctly diagnosticated as a shallow, imperfect, undeveloped uterus has become gravid and, mayhap, after repeated abortions, has been able to carry a fetus to full term, and thereafter, reconstructed by normal involution, has maintained its proper adult condition. Only a few cases have this fortunate termination, and the prognosis is more gloomy in cases of superinvolution occurring in women of somewhat mature years.

The surgical treatment of uterine flexions is so treated in an appropriate part of this work that its discussion as curative of dysmenorrhea may be omitted here. But, assuming that the flexions of the uterus are caused by defective development, one might well look to the hygiene of the adolescent girl as a prophylactic against the deformity. It is not going too far to say that the conventionalities of refined European and American life directly tend to undeveloped genitals in the young girl. The contrast between what is decent and proper among girls of our time and tribe and girls living under savage conditions is very great. The little children in many tribes of savages are encouraged to attempt and to practice copulation until puberty, when, except among the most degraded, the girls are withdrawn from such possibilities. In many Oriental countries the girls are not only pledged in marriage in babyhood, but they are actually delivered over to their spouses before puberty. This is a very wide usage also among savages; it has been a source of horror and dismay to our red men that the girls sent to Government schools menstruated while at school, and the basis of this rage and astonishment is the Indian's conviction that menstruation at school is a sure sign that his little children have been debauched; for so early do Indian girls enter into the marriage relations that, as a rule, they do not menstruate until some time after they have found a place in the husband's lodge. Practices so repugnant to our notions of decency and morality seem most unnatural, and yet they belong to a state of Nature, and, whatever may be the decrees of fashions and civilization, there can be no doubt that the early sexual life, arousing rather than dwarfing the prophetic sexual instincts of girls, tends to develop the uterus. The free and licentious conversation of pastoral life, and even of agricultural life in some countries, is doubtless a stimulant in the same direction, and these stimulants are forever withdrawn from our girls in the name of decency.

This must be so; but the mischief wrought by the young girl's dress is remediable. When her breasts begin to bud the young American girl's shame of them is made a virtue by her mother, and, while she cramps them up with a long and stiff corset, she jams all abdominal viscera down toward the pelvis by the same apparatus. Most girls say, and say truly, that the corset is not very tight; the mischief is done even by moderate pressure at the wrong place and in the wrong direction. A short and flexible corset, loosely worn, might be a beneficent thing by distributing the pressure of waistbands, while a long corset, stiff in front if not elsewhere, is a positive injury by transmitting pressure downward, by increasing constipation, and by interfering with the circulation in the uterus and its appendages.

The circulation in the uterus seems to be directly related to, and connected with, that of the lower extremities. It is the misfortune of the American girl that her legs are going into a state of disuse by reason of perfected artificial locomotion and elevators. As a matter of uterine hygiene, and as a provocative of uterine growth, she should walk much. Lawn tennis should be cultivated and other games of the sort. Since it involves walking, one might even say a good word for golf. The bicycle used without excess is admirable. Housework, with its infinite variety of posturing, is to be commended. Horticulture, with its carrying and stooping and rising, is an ideal pursuit. Gymnastics might be scientifically prescribed for the legs and the whole body, but there was never yet a girl who in dreary solitude would practice bodily movements for the sake of exemption from vague and half-guessed pains in the far future, and for that reason girls' gymnastics must incline to games, with something of excitement and rivalry and the exhibition of personal prowess.

Many girls have the feet habitually cold in summer, and in winter so cold and numb as to be beyond the perception of suffering. It is very important that this state of arterial spasm should be broken up, for it is, as has been suggested, directly related to deficient blood supply to the pelvic organs.

When there is a marked flexion with dysmenorrhea the flexion must be dealt with on surgical principles laid down elsewhere in this work.

Stenosis, when it is believed to be a cause of severe dysmenorrhea, should be dilated. The treatment is indicated whether it is held that mere obstruction is the cause of the menstrual pain or not, for in the latter case we have reason to believe that the stretching process interrupts unnatural and pain-producing channels of nerve conduction.

Extending his observations over 2,000 cases of marked dysmenorrhea, Emmet found that about 75 per cent. of them were sterile, and in this fact we find another reason for dilatation, for it will often happen that, after that operation has been thoroughly done, pregnancy ensues, and this, while a positive benefit incidentally, tends to the cure of dysmenorrhea.

The choice will lie between gradual dilatation, which requires no anesthesia and may be done at the consulting room, and rapid dilatation, which faces all risks of sepsis and inflammation once for all. In 1893 Goodell reported 400 cases of rapid dilatation with hot antiseptic irrigation and gauze packing, and no untoward results, and, while others have not so enthusiastically advocated the operation, it is conceded that it is not a grave one.

In the gradual dilatation of tough strictures electricity is of much assistance. A sound is insulated to within 2½ inches of its tip and is passed into the cervix. When resistance is met with a current of 10 milliampères will often cause the resistance to disappear in a few minutes. The treatment is completed by a current of from 20 to 50 milliampères for five minutes only. The sound will drop out easily and should be replaced by a larger one at the next sitting. The sound is, of course, connected with the negative pole, and a clay electrode with the positive.

For the treatment of flexions and strictures by the cutting operations of Simpson, Sims, Dudley, and Schröder, and for the modification of those operations, the reader is referred to the appropriate chapters. The treatment in all cases seeks to amend any possible stricture and to interrupt the channels of painful nervous reflexes. Reference to other parts of this work is also made for the proper treatment of displacements of the uterus by tampon, pessary, or operation on the ligaments or upon the floor of the pelvis; for these surgical devices may need to be invoked for the relief of dysmenorrhea. Like reference must be made also for the appropriate treatment of metritis and endometritis.

The pain of dysmenorrhea is much relieved by drugs, which are not strictly anodyne, but rather antispasmodic. *Chloral* and *croton chloral hydrate* will control many cases. Some of the milder cases of pure neuralgic type will yield to a single sound sleep induced by *trional* or *sulphonal*. *Sulphonal* has a specially powerful sedative action on the lower portion of the spinal cord, whence the uterus and its appendages receive their spinal supply. *Atropin* will relieve a certain number of cases, and seems to benefit those women most who never have warm feet or a blush of pink upon the general surface of the body. To be of use the drug should be given in increasing doses for five days before menstruation, and it should be so managed that the face shall be flushed for one or two evenings. Most unfortunately, *alcohol* has a similar effect in like cases. As it breeds an indifference to small discomfort, it is very seductive and should not be used.

Amyl nitrite may be used with good effect in cases where the pain comes and goes in waves. A few drops may be poured on cotton in a wide-mouthed bottle and the patient permitted to inhale the volatilized drug from time to time, as the pain demands. *Cannabis indica* will mitigate the pain. Unfortunately its anodyne effect is rarely produced until the patient is about to experience some disagreeable confusion as to time and space. Gelsemium is a drug much more available, yielding anodyne effects long before it produces diplopia. The depressant effects of the *bromids*, affecting the whole nervous system, should be borne in mind. In ordinary cases the relief from pain under the bromids is too dearly purchased. *Camphor* yields surprising results occasionally, but is worthless in most cases.

Brisk eliminant treatment, with the administration of *salicylates of sodium, ammonium,* and *lithium,* will so signally relieve certain cases as to reveal the gouty or rheumatic diathesis.

In all cases, and especially in these last, *acetanilid* will relieve the pain of menstruation. It is as valuable as any of the high-priced, licensed, and patented "coal-tar derivatives." There is no good reason for combining it with alkalies or with caffein, as in the popular secret mixtures. Like its chemical cousins, it is directly depressant and ultimately destructive to the most important elements of the blood or probably to the tissues, and its anodyne effect is produced by paralysis of nerve endings. That it is a poison in all doses should be remembered, and it should only be used as a makeshift or as antagonizing the rheumatic poisons. It is distinctly contraindicated in anemic or debilitated patients. Cyanosis, sweating, and dark urine show overdosing.

As an anodyne, an antispasmodic, and remotely as a hypnotic morphin is an ideal drug in the treatment of dysmenorrhea. Its deleterious effects upon the digestive tube are such that it should be reserved for emergencies. Nine out of ten female morphin habituées have learned to use this seductive poison from its employment originally in the treatment of dysmenorrhea. The physician who uses it should never name the drug in the presence of the patient, and the possibility of having a prescription refilled should be wholly forestalled. The active treatment of anemia and chlorosis in the intermenstrual period will be the best treatment for dysmenorrhea in many cases which have no pelvic disease or defect.

Fermentative dyspepsia is relatively common among dysmenorrheics. It is sometimes necessary to treat this complication most actively. Active purgation just before menstruation has more than a palliative effect on dysmenorrhea in some cases; it reduces pelvic congestion, and possibly assists in ridding the system of poisons which tend to neuralgia. Heat is an admirable palliative. Patients will usually suffer less when rolled up in a superfluity of blankets. Hot foot baths and sitz baths give an amount of relief which freshly shows the patient that congestion and pelvic pain are linked together. Great comfort is oftentimes obtained by chasing the sharpest pain from the sacrum to the abdomen and back again, by the application of a bag of hot water.

MEMBRANOUS DYSMENORRHEA

In some cases of dysmenorrhea the pain seems to be intimately associated with the appearance of a membrane in the form of a three-cornered pocket or of shreds and patches. In a very few cases the membrane gives a copy of the cervical canal.

Some authors have held the membrane to be the result of a slight exaggeration of the normal process of shedding of epithelium; others hold it to be an exfoliation of the entire mucous membrane instead of its superficial layer; others see in it the plastic lymph of metritis organized; others, with less charity for unmarried patients, hold it to be the decidua vera of a pregnancy which has come to an early termination.

And there is a similar disagreement as to the immediate cause of the production of this membrane. Literature shows that it may be due respectively to flexions, versions, an os too small or too large, a constricted cervical canal, a constricted internal os, congestion of the mucous membrane, hypertrophy of the mucous membrane, hypertrophy of the uterus, metrorrhagia, disease of the ovary, anemia, chlorosis, syphilis, and hysteria. Nevertheless, many of the subjects of the affection are exceedingly healthy women, and some of them menstruate with so little pain as to make the term dysmenorrhea inapplicable.

In the present state of our knowledge it is safe to say that the characteristic exuviæ are the product of an endometritis of low grade. The membrane does not differ in any appreciable degree from that which is sometimes thrown off in cases of acute phosphorus poisoning, in typhus fever, and in cholera. It has been precisely imitated by severely cauterizing the interior of the uterus, for following that procedure there has sometimes appeared a three-cornered sac consisting of fibrous tissue "faced with a mosaic of cylinder epithelium." Schönheimer has had the opportunity of studying the membranes cast off by a woman who was sterile and had one thick tube, and he found nothing notable except fibrinous deposit full of leukocytes and uterine epithelium. In this case dilatation and curettage brought away normal endometrium.

Membranous dysmenorrhea usually appears in early menstrual life. It may, however, appear later, to the dismay of the patient. Cook reports the case of a single woman, thirty-five years of age, who had often passed shreds of membrane, but who came under suspicion of pregnancy by passing a complete cast of the interior of the uterus while visiting. Under his observation she passed similar casts for two successive months. In Schönheimer's second case the woman had borne six children without anything anomalous in her menstruation. After bearing these children she began to pass a uterine case without pain at every third period.

The affection sometimes disappears as abruptly. Coughlin records a case of a virgin thirty-one years of age who passed the characteristic membrane with great suffering. She was under observation afterward for some time and had no recurrence.

The affection is exceedingly rare. Kleinwaechter made a collection of all accessible reports of cases, and could only find 80 cases recorded.

The membrane is seldom passed at a first menstruation. It is most common between twenty and thirty years of age. Nearly 80 per cent. of cases recorded occur in married women. Relative sterility belongs to the disease; only 9.5 per cent. of the cases in married women become pregnant. Pregnancy does not appear to be curative in any degree.

The *symptomatology* of membranous dysmenorrhea is simply pain and the appearance of the membrane. The pain is not always severe, nor is it always promptly relieved by the appearance of the membrane. The flow is preternaturally great, though there are exceptions to this rule. The increased flow is explained by the facts that there is a large surface suddenly denuded, and that the membrane, as soon as it becomes a foreign body, acts as a stimulant and irritant to the uterus.

When membranous dysmenorrhea has no history it will require a microscopic investigation to exclude abortion from the possibilities. After the affection has continued for some months abortion is certainly excluded. Nevertheless, there are some sterile women who, between shame and hope, will tell of 12 and 13 abortions in a year.

The *treatment* of membranous dysmenorrhea by divulsion has not been satisfactory. Here and there a nulliparous patient who passed large membranes has received benefit. The *curette* usually brings away normal endometrium, and makes no impression on the next menstruation. Strong applications of *phenol, iodin, nitrate of silver, caustic potash,* and *nitric acid* have been used with a vague hope of reconstituting the endometrium for the better; but it has been altered not a whit. Cauterant applications of electricity have not succeeded better. Gunning reports a softening and disintegration of the membrane after a series of treatments by mild currents of galvanic electricity. He places the negative pole at the fundus and the positive pole just within the external os. His first current is as light as 5 milliampères. After a few séances the current is raised to 10 milliampères, continued for five minutes, and repeated every three days.

INTERMENSTRUAL PAIN

Intermenstrual pain is here considered because it has its relations to the menstrual period. Coming between the periods, it certainly can not, in strictness, be allied to dysmenorrhea.

Intermenstrual pain is referred almost invariably to one ovarian region or the other. In some patients the pain changes from one side to the other from month to month. If there is an overflow of pain from the ovarian region the iliac fossa, groin, and thigh are affected. Sacral pain is not characteristic of this affection. No change of posture will alter the character or amount of the pain. The pain is distinctly paroxysmal and intermittent in character. The attacks are brief, lasting two, three, or four days in most cases. Fever is not observed.

As to the time of attack, each case is a law unto itself. Palmer reports a case in which the pain came on four days and a half after the cessation of menstruation, but this is unusual. In his second case the pain appeared about eight days after the cessation, and in his third case about eleven days after. William O. Priestley gives two cases in which the pain came on fourteen days before menstruation. Thomas and Munde give cases in which the pain appeared at nine, ten, and seven days after menstruation ceased. Some reporters vaguely speak of attacks covering four or five days in the middle of the intermenstrual period. One of Palmer's patients began to have the intermenstrual pain after confinement. She suffered ten years, then had an abortion followed by severe pelvic inflammation, then, after a slow recovery, experienced some relief, the attacks becoming milder, shorter, and less frequent.

No pathology has been suggested for this curious affection other than that which attributes the pain to an ovary which, by the slow changes of inflammation, has become so dense as to make the passage of the ovule from the deeper layers a very difficult one. By hypothesis there is some definite date for each woman at which, measured from the close of menstruation, active preparation for the ripening and extrusion of an egg begins. This hypothesis involves the doctrine that pain is produced by tension about the growing follicle, and that the pain ceases abruptly when the follicle finally fights its way to the surface of the ovary, and is free to ripen and rupture. The doctrine harmonizes the facts that the cases do not present much uterine disease, that several of them at autopsy have shown dense ovaries, and that the patients are relatively, though not absolutely, sterile. Another and more tenable theory is that the pain is caused by ovarian adhesions which are placed upon a tension by the periodical recession of the menstrual blood pressure, a recession which reaches its climax about the middle of the intermenstrual period.

Treatment is as inefficient as this pathology would indicate. Some have held that benefit was given by tampons of ichthyol and boroglycerid, and the great "alteratives," iodin, arsenic, and mercury, given for a long time. During the paroxysms anodynes must be used.

CHAPTER VI

VICARIOUS MENSTRUATION

If menstruation implies the casting off of endometrial elements then the term vicarious menstruation can only be justified on the plea that it is convenient, for it certainly is inaccurate. The term vicarious hemorrhage has been proposed, but this is equally inexact in that it carries the implication that hemorrhage is an essential part of menstruation instead of a mere incident. We, therefore, use the older term, vicarious menstruation, arbitrarily, as indicating no more than hemorrhage which appears from some part of the body other than the uterus and in response to the menstrual molimen.

Though the cervix uteri has no part in ordinary menstruation, it is such a near neighbor to the uterus that we might expect it to be the source of vicarious discharges. Few cases are recorded. Ashton gives an account of a woman from whom he removed cancerous ovaries, whereupon she began to menstruate at the rate of four or five days every two weeks. He soon had occasion to remove the uterus close to the vaginal junction, and closed the wound with peritoneum, whereupon she began to menstruate scantily from the cervix every four or five weeks.

The tubes have occasionally presented at fistulæ in the abdominal wall, and in a large proportion of cases yield a red discharge at the time of menstrual molimen.

In ventrofixation of any part of the pelvic organs after operation vicarious hemorrhage has occurred. Thus, in 1884 Rein showed a woman from whom he had removed an ovarian cyst and had fixed the pedicle in the abdominal wound. Healing had taken place promptly, but at one point there occurred a small slough just before menstruation, and from that sloughing point came blood during the whole catamenial period. This had occurred for three years.

The flow does not necessarily come from mutilated genitalia, but may come from other parts of the body, particularly from the mucous membranes. The nose is the most prone to vicarious menstruation. Macnaughton Jones reported a case in which there was no epistaxis, but in which a baffling nasal ulcer was conquered only after eleven months' treatment, and during the greater part of this time it was much worse at the menstrual periods. Withrow has reported two cases, already cited in these pages under Amenorrhea, in which there were lifelong amenorrhea and periodical epistaxis.

Periodical hemorrhage from the stomach has been diagnosticated as symptomatic of an ulcer at its onset. Charles T. Parks, of Chicago, reports a curious case of a woman who was sick for eighteen months, and for four months had defecated at intervals of from one to four weeks. For two months after coming under observation she failed to menstruate, and at the proper menstrual times she vomited torrents of blood. Her mental and physical condition became so bad that when fecal vomiting came on an exploratory incision was made. Enlarged ovaries were removed. Scybala in enormous quantity were expelled. The urine, which for four months had been reduced to one ounce per diem, rose to normal amount, and recovery ensued.

Hemoptysis is sometimes due to the menstrual excitement. Norton tells of a woman who menstruated from the age of fourteen with much pain and cramps. At the very first menstruation she had a smothered or choking sensation, followed by a coughing paroxysm during which she spat blood freely. This was repeated after a few hours, and so continued until the fourth day, when the vaginal discharge was growing pink. From this time the bloody expectoration diminished to the vanishing point on the fifth or sixth day. She had a small uterus, high in the pelvis, with a minute os. Nevertheless, she became pregnant after five years of married life, and during her pregnancy she continued to menstruate after her fashion, with vaginal discharge and bloody expectoration. The last menstruation was about ten days before delivery. During all the years that she was under observation she was a hysteric. Chadbourne has made the important observation that many girls who have periodic hemoptysis, either synchronous with menstruation or replacing it, have incipient phthisis.

Sometimes the hemorrhage is from the ear. Lermoyez reported the case of a girl who had a periodic discharge of non-coagulable blood from the right ear. After three years of this vicarious discharge normal menstruation was established, whereupon the aural discharge appeared only once in two or three months.

Sometimes the weak point is found at a nevus. Bloom records the case of a girl sixteen years of age who bled from a nevus of the face. The hemorrhage came always two days before menstruation and lasted until the end. After two weeks there was another slight bleeding. Two teat-like projections furnished the blood. One of these being ligated, another appeared at the same site.

Many cases of bleeding cicatrices have been reported. Kerley presented to the New York Academy of Medicine an Irish girl twenty-five years of age. At the beginning of her menstrual career at the age of fifteen she developed an abscess at the level of the cricoid on the left side. From this point there had been a discharge of bloody pus four days out of every twenty-eight through the whole ten years. In each intermenstrual period the cicatrix healed.

Vicarious hemorrhage is most common from the nose. Next in order of susceptibility come the stomach and intestines. The hemorrhage has been observed to appear in the retina and under the conjunctiva. The vocal cords, the nipples, and the bladder have also been the seat of vicarious bleeding. We have no philosophy for this remarkable phenomenon, save the doctrine, repeatedly expressed in this chapter, that the human organism has inherited, and has intensified, a strong tendency to hemorrhage at the menstrual time. So strong is the impulse that it is felt at remote points in rare cases. We can not rest upon mere increase of arterial tension, for, though there is a slight increase of tension at the menstrual period, it is so slight that it becomes as naught when compared with other variations of blood pressure.

A case reported by J. R. Wallace is instructive in this connection, for it indicates that Nature sometimes blindly confuses two discharges under the stimulation of the menstrual molimen. The subject was an Anglo-Indian lady who menstruated at twelve years and was married at twenty-three. She proved to be sexually impotent, incapable of orgasm, and, after enduring eight months of frigidity, her husband parted from her in disgust. Upon this ensued six years of amenorrhea, but during these years, at regular menstrual intervals, her breasts would become hard and painful, and milk would pour from them freely. She had good general health and no pelvic pain. She laid on an immense amount of fat, increasing her weight from 98 to 245 pounds. At the end of this period of six years Wallace had adjusted an intrauterine stem and a slight discharge of blood was noted for three days. Four weeks later she had high fever, turgid breasts, and resumed normal menstruation, and at the time of the report she had so continued to menstruate for six months. During this last period the mammary engorgement had diminished, and she had lost 28 pounds. It would appear that the brief irritation of the uterine stem had determined the direction of overflow for this singular case.

[illegible]

[illegible]

[illegible]

[illegible]

have a mural or submucous situation tend, in general, to maintain the menstruation to the age of fifty, or beyond that.

The uterus is said to become a trifle larger and heavier at the beginning of the menopause. Whether this is true or not it is certain that the tendency is presently toward atrophy. The walls become demonstrably thinner; the cervix becomes shorter and thinner; the os internum is sometimes obliterated; the uterus is smaller in all dimensions; the endometrial glands become smaller, and their numbers diminish.

The rule is that the uterus atrophies later than the tubes and ovaries. A competent observer has found the ovaries of normal size three years after the menopause, and it is known that ovulation is often prolonged for years after the uterus has ceased its functions.

Changes in the ovaries at the time of the menopause have been studied by Otroschkevitch, who has come to the following conclusion:

"The lessening of both ovaries in old age arises in connection with increased growth of fibrous connective tissue and the predominance of this over the degenerating follicles. The disappearance of the epithelium covering the surface of the ovaries which occurs in old age can not always be put down to separation during preparation of microscopical specimens, but must rather be taken as one of the true changes in the senile ovaries. Dessication of mature and wholesale degeneration of the primordial follicles form one of the chief and most important changes in senile ovaries. Hyalin degeneration of the arteries and fibrous tissue progresses with age, and in very advanced age striking examples of this degeneration are found. Fatty degeneration of the cellular skeleton occurs fairly often, and is evidently dependent upon the deficient nutrition of the ovary. A direct connection between degeneration of the vessels and diminution in function of the ovaries is not substantiated, for the ovary becomes limited in function, when there are still but few vessels affected by degeneration, and, therefore, at a time when its nutrition is but little altered. The nervous system plays the chief part in the complex process."

At the menopause women, like men at a corresponding age, suffer from a deposit of fat which is oftentimes a serious burden. The masses deposited in the abdominal wall and in the omentum are absorbed in great degree in later life, or, as some think, are simply redistributed. The mesentery also takes on a large amount of fat. About the heart, in the pericardium, and in the subpericardial connective tissue the accumulation of fat becomes very embarrassing, leading to such serious symptoms as hurried respiration, cardiac asthma, cardiac palpitation, venous stasis, and, in the worst cases, to albuminuria and edematous feet and legs.

About one woman in ten will be annoyed while at the menopause by flashes of heat running over the face and neck, and sometimes sweeping over the whole body. The heat is a subjective sensation and is not real. The sensation is caused by a temporary vasomotor paralysis which permits the extreme dilatation of the small vessels. Sometimes profuse sweating follows these waves.

Metrorrhagia has no place among the normal phenomena of the menopause. It occurs rarely, though the folklore of the women keeps them dreaming of torrents of blood at the change of life. Scanzoni himself endeavored to explain the profuse hemorrhages of the menopause by assuming a great friability of the blood vessels, and Kisch has taught that the softening and relaxation of the uterine substance are the cause. But, as a matter of fact, their theories are superfluous, for hemorrhage is not an incident pertaining to the menopause. Metrorrhagia, when it does occur at that time of life, is usually induced by some one of the ordinary causes which we have enumerated elsewhere. Baer has analyzed 2,200 cases of metrorrhagia, and shows that the profuse hemorrhage belongs to the early years of greatest fecundity and to any period of menstrual life rather than to the menopause. In five years following the age of twenty-nine there were 364 cases; in five years following the age of thirty-four, 333 cases; in five years following the age of thirty-nine, 223 cases; in five years following forty-four years, 131 cases. In the years between twenty and forty-three were 1,533 cases, and there were only 667 cases for all other ages.

It is at the menopause that inhibition fails and lurking cancer advances by leaps. Any metrorrhagia at this time of life should excite suspicion of cancer. A serous discharge is sometimes the warning of cancer and sometimes of senile endometritis.

With the atrophy of the hypogastric plexus come some disturbances of the sympathetic nervous system, though the reflex disturbances of the stomach and intestines at the menopause have certainly been exaggerated in medical literature. The dyspepsia of this time of life is not peculiar to females. Many alert practitioners have worked through a lifetime without seeing the alleged diarrhea of the change of life.

The heart is more disturbed at this time than perhaps any other organ. By far the larger number of cases of tachycardia in women appear at the very first announcement of the menopause. It is a noticeable fact that tachycardia is most likely to afflict those who experience the menopause early in life. Few cases have come to autopsy, but those few have almost invariably confirmed the theory that the tachycardia belongs to the exceptional cases in which there is early shriveling of the ovaries with hyperplasia of connective tissue, and it is a part of the theory that the nervous reflex, doubtless a stimulation of the accelerators, proceeds from the cirrhotic ovaries. Tachycardia is also common in cases in which the operations on pelvic organs have caused adhesions. Tachycardia should be carefully distinguished by the strong, full, regular pulse, the irritable disposition, the throbbing aorta, the constriction of the chest, and the high percentage of hemoglobin from the weak heart, announced by a weak and fluttering, easily compressible pulse, and the low ratio of hemoglobin which accompanies this sort of debility.

Glycosuria is sometimes present in the years about the menopause. The prognosis is not so grave in these cases as in glycosuria in general, for the theory of causation permits us to believe that the disease is produced by irritation of the sympathetic supply of the liver, and permits us to hope that when the immediate nervous irritation from ovaries and uterus shall have ceased by atrophy there will be a tendency toward recovery. In many of these cases of glycosuria vulvar pruritus is the danger signal.

Early in the menopause there is sometimes noticed a curious mental exaltation. While it lasts the woman becomes inclined perhaps to meddle with business affairs which concerned her not in earlier life; she has large plans; she essays large tasks; she proposes for herself all that is difficult or impossible. It is a state of mind which does not last long.

Far more frequently the mental condition of the menopause is one marked by depression. The sane woman at the change of life is one who, as a rule, suffers depression rather than mental exaltation. If the perturbation of the time drifts into a positive mental alienation it is likely to take the form of melancholia and hypochondria, and passive forms of hysteria. Not that more active forms of insanity are excluded. At this period may appear strong irresponsible impulses, active moral perversions, delirium, and acute mania. Of these and of all sorts of insanity it may be said that the prognosis is good, if there are not too many neurotic defects in the ancestry.

At the menopause that which seems to be an insanity or a radical change of character, newly acquired, is upon close study seen to be merely an exfoliation of mental habits formed in the best years of life. Thus stripped, the patient returns to her earlier mental condition, revealing traits which were suppressed through her young womanhood. In one woman we may see something of child-like trustfulness and pliability appear; in another disagreeable childish traits appear when the veneer has been peeled off; and she who was tidy is slovenly in her house or her person, becomes stubborn about small matters, and is absolutely frivolous in conversation and in behavior. Addiction to alcohol and other nerve-tickling drugs sometimes becomes pronounced at this time, and the demand for these drugs seems to have no other basis than childish ennui and a babyish lack of self-control. The patient, no longer busy in life, no longer self-centered, can not abide solitude and relies wholly on company. She becomes exacting in small matters, and jealous, not of her husband alone, but of all upon whom she has claims. It is a curious fact, and fortunate, that many such cases, having fallen into this advanced senile state, will work out of it again and go through many years of later life sane and serene.

No doubt we pay too much attention to the physical changes accompanying the menopause and too little to the tremendous mental change which comes to every woman at that period of life. A man grows old by merciful and gentle gradations, and so he slides, half willingly and half unconsciously, into the afternoon of life, with regrets so soft that they can scarce provoke a sigh. But for a woman man's twenty years of gentle change are compressed into two; she is rudely compelled to make an abrupt change of mental attitude as regards life and love, and the big world and the great future. It is evolution for him; it is revolution for her. She is suddenly brought to perceive that her charms, her youth, her sex itself are passing from her. She is invited with cruel abruptness to be to her husband merely an intellectual companion or a sexless helpmeet, when she has been of late the object of his embraces and the mother of his babes. One-third of her adult life is still before her, full of promise of placid enjoyment and great usefulness, but to her, remembering the glory of conquest and surrender, the future stretches a dreary waste of empty years.

It appears small wonder, therefore, that with this sudden violence done to lust and love and pride and hope the woman at the climacteric, finding a sharp boundary set to her warm young life, beyond which she must walk into a gray and passionless old age, should be the victim of a sadness which may drift into a melancholy and so into a madness. The explanation of the psychoses and the neuroses of the menopause is not to be sought in absolute senility, nor in the accumulation of menstrual poisons, nor in the lack of ovarian juices so much as in the suddenly changed mental atmosphere of her who stands reluctantly between youth and age, bereft of all that she most valued in herself.

Treatment of Perturbations of the Menopause.—The menopause itself needs no treatment. But, since it is a season of nervous depression, and a time when the vital powers are failing, latent diseases and defects hitherto well borne or suppressed assert themselves.

The gouty diathesis or the rheumatic taint may demand treatment by elimination, regulated diet, and prescribed muscle waste. A syphilis may need a course of treatment after it has been forgotten for years.

Perineal and cervical lacerations, hemorrhoids, and varices may cry for attention, not merely because the menopause is at hand, but because the woman is no longer young, and repair is slow, resisting power is lessened, and inhibition by the higher centers over the irritated lower centers is withdrawn in some degree.

Climacteric fat may become a burden so grievous that the ingestion of hydrocarbons must be restricted, drink must be limited, and vapor baths and physical exercise must do the rest.

Dyspepsia, diarrhea, and constipation may be so extreme as to be interpreted as manifestations of profound disturbance of the sympathetic supply of the intestines by an irritation proceeding from the genitalia. At this time errors of diet and regimen will tax the patience of the physician who would detect and correct them.

The circulatory disturbances of the menopause are mostly affections showing stimulation of the accelerators. Digitalis is much abused in these cases. Veratrum viride is more indicated when a sound heart is to be dealt with.

The heart is not involved in the curious flushes and subjective flashes of heat. The bromids, used with due regard to their depressing effect, will yield very good results in these cases. Many women, when they are made to understand the nature of these sensations, do not care to have treatment for them.

Insomnia is a very troublesome symptom of this time of life, and will demand careful treatment. The patient may take a certain amount of hypnotics, but always with the knowledge that they are great evils, introduced only for emergencies, and that the main remedial agents must be open-air life, moderate fatigue at bedtime, a mind at rest, and plain food. The attendant who is justified in the occasional use of hypnotic medicines will do well to keep his own counsel, and never permit the name of the drug to cross his lips, attributing each sound sleep to anything other than the drug he has used. If his wakeful patient becomes his confidante he will find himself unable to baffle her when she sets herself to use drugs for the induction of sleep at her own pleasure.

Tachycardia, mild or severe, occurring at the menopause will usually end in recovery when the ovaries have had time to lose their nerve elements and have ceased to tease the sympathetic system. The cases in which there is a dilatation of the heart do not tend to recovery, though they usually improve after the patient has ceased to menstruate for some years. Plainly the source of irritation is not always in the contracting ovaries; tachycardia has, in rare cases, come to an end after the removal of cicatricial tissue at a laceration of the cervix.

In some few cases, with great nervous fretting and poor nutrition, a period of rest and seclusion away from home may avert absolute insanity. This treatment with high feeding is indicated especially women who have long been overworked. The beneficial effects upon thoughtless or deliberately cruel home people is sometimes the c justification for sanitarium treatment. There are many patients, the other hand, who are in danger of grave psychoses because they l nothing to do, and it may be possible for the physician to suggest s avenue through which the patient may find her way to useful w renewed zest in life, and some promise of a mind at peace. Cer it is that mere drug therapy can avail little for those who are o worked or for those who have no occupation.

APPENDIX A

METHODS OF EXAMINATION AND DIAGNOSIS

The first object of the examining surgeon is to get a mental picture of the case before him. This is accomplished (a) by securing a clear history of the case; (b) by scrutinizing observation of the patient during the interview; (c) by having recourse to the resources of general clinical diagnosis, and (d) by physical examination of the patient.

THE HISTORY OF THE CASE

It is better for the practitioner who limits his practice to a particular department always to secure, first, the general history of the case, and, secondly, the history as it applies to his own department of practice. I have followed this rule rigorously for a number of years, and feel that as an initial step it has always given me a better general comprehension of my case than if I had begun with the present complaints of my patient and endeavored to follow them back. It is true that, having arrived at a broad understanding of my patient, I always endeavor, as a secondary step, to trace existing symptoms and conditions back to their respective causes. This is done by a process of cross-examination intended to develop the consistency of the patient's story, and to test her intelligence in her own interpretation of her condition. To arrive at this result I begin by recording the history on a blank, which is arranged to assist me mechanically in carrying out my plan, and has the following essential features:

THE RECORD FORM

(1) *Identification.*—(a) Name, date, residence, occupation, age, sex, race, and marital state of patient. (b) Name and address of near relative or friend. (c) Name and address of person by whom referred.

(2) *Heredity.*—(a) Parents, (b) grandparents, (c) brothers and sisters, (d) children.

(3) *Functional.*—(a) Menstruation, date of puberty, early history of, periodicity, quantity, character of flow, pain, date of last menstruation. (b) Bowels, frequency and character of movements. (c) Urine,

frequency, quantity, analysis. (d) Uterine secretion, character, quantity, microscopic examination. (e) Perspiration. (f) Reproduction, dates of marriage, childbirths, and miscarriages. (g) Blood examination.

(4) *Previous* (a) illnesses, and (b) accidents.

(5) *Complaints.*—(a) Patient's story of her present condition told in her own way; (b) as told under cross-examination.

(6) *Physical Examination.*—This should embrace at least a cursory investigation of all other regions, before the genitourinary examination is made. In this way a complete survey of the case is insured.

(7) *Treatment.*

These memoranda are printed consecutively as given above on the record blank, which is a form page sheet, folding, to be filed on the card index plan. The sections to which answers refer are written, as needed, on the margins of the blank sheets. My experience with forms made out *in extenso* has been that the spaces left for answers are always either too much or too little. The arrangement indicated obviates this difficulty.

THE PHYSICAL EXAMINATION

After having made and recorded an oral examination of the patient, the next step involves a physical investigation by inspection, palpation, and pelvic exploration. The events under consideration in these pages are made applicable to office consultations, hence details are given adapted to that environment. Suitable rooms are requisite, and should number three or more, *en suite*—one a reception room, another a consulting room, and a third solely used for the examination. In this last there should be running water, hot and cold, and a toilet room adjoining is well-nigh a necessity. The examining and toilet rooms should be presided over by a comely woman, trained as an office assistant. She need not necessarily be a nurse, but she should be a trustworthy woman, competent to hold a speculum, and intelligent in all that pertains to gynecological work.

Equipment for Examination Purposes.–The armamentarium should consist of a table, or office chair, specula, dressing forceps and tenacula, douche apparatus, absorbent cotton and antiseptic wool, sounds and applicators, lubricant, protective or pad, sheet, and gown.

An assortment of Sims specula is essential, and one or two good bivalves will be convenient. Every successful gynecologist knows the value of the Sims speculum, and every one who expects to practice the specialty must of necessity make himself familiar with its uses. The objection often made to it is that a competent person is required to hold it. If the beginner can not employ such a person then he must provide himself with one of the so-called self-retaining Sims instruments. It is the simplest and can be held easily by the patient, who will grasp a piece of rubber tubing passed through the fenestrum of the buttock blade.

Sounds and applicators are included in the office outfit, but it is proper to remark that they seldom will be needed. The indiscriminate use of the sound has proved harmful to many women, and it should never be used by unskillful hands. Nevertheless, it will occasionally be serviceable as an aid to diagnosis, hence is included in the list. Applicators, too, will rarely be employed. We need not enter into a discussion of the propriety of topical applications to the endometrium, but it will suffice to say that as a routine it is of doubtful propriety. Occasionally, however, such treatment is needful, hence the instruments must be at hand.

Cystoscopes of both the Kelly and Nitze patterns should be at hand, together with urethral specula and dilators and other necessary accessories.

Rectal specula and sigmoidoscope should be available.

The Douche.—A douche apparatus should be at command for all office examinations or treatment. It should consist of a reservoir that will hold at least a gallon of sterilized water, with rubber tubing attached to a vaginal douche nozzle with backflow arrangement, and the tubing should be equipped with a gate or cutoff. Before examination the woman should be divested of unnecessary clothing, such as corsets and superfluous skirts, then placed upon the table in the dorsal posture, with feet in the foot rests, and the pad or protective properly adjusted to prevent wetting or soiling the clothing. After covering her with a sheet, the douche may be administered. This should consist of an appropriate quantity of sterilized water at a temperature of about 115° F. If there is suspicion of infection the douche should be rendered antiseptic by the addition of bichlorid of mercury sufficient to make a solution of 1 to 2,000.

The Preparation of the Patient.—The preparation of the patient may be made by the office assistant, who should be a competent woman. She should arrange the clothing of the patient, administer the douche, and, if need be, give an enema to unload the rectum. This latter is important if there is constipation, as a distended lower bowel may mislead in diagnosis. Such a condition not only displaces the pelvis viscera, but it may be mistaken for a tumor, new growth, or retroverted uterus. After these preliminaries the patient is ready for the examination proper, which, it is almost needless to add in these days of asepsis, should be conducted with the utmost aseptic care.

The Hands of the Examiner.—The hands of the examiner should

the knees will naturally fall apart (Fig. 376). In this position digital and specular examinations are readily conducted. The slight elevation of the head and shoulders and the flexure of the legs favor relaxation of the muscles of the abdominal walls, a condition that is essential to success of the bimanual examination.

(c) The Left Lateral Prone Position.—This is the classic Sims position, and is favorable to inspection by the use of the perineal retractor, known as Sims' speculum. It is exceedingly important in certain conditions, such as vesicovaginal fistula, for which it was devised. It likewise affords an opportunity to see the condition of the cervix. But, under influence of atmospheric pressure, any displacements of the bladder or, in absence of adhesions, of the uterus are at once corrected, and may consequently escape detection. The position is not favorable to examination of conditions of the posterior vaginal wall, nor to the bimanual manipulation, since the general adoption of which it has largely fallen into disuse. The posture is shown in Fig. 377, with another view in Fig. 378.

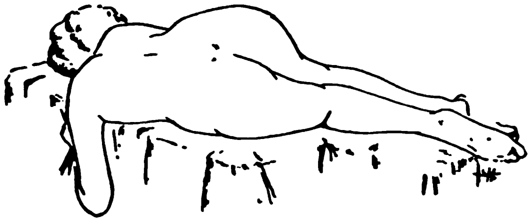


FIG. 377.—LEFT LATERAL PRONE (SIMS) POSITION. This position is essential for examination by the Sims method.

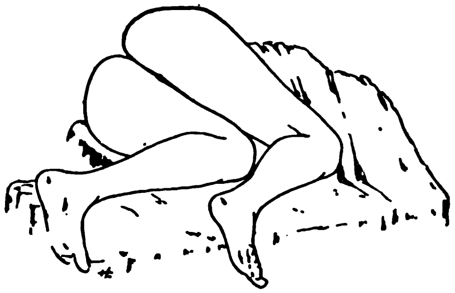


FIG. 378.—LEFT LATERAL PRONE (SIMS) POSITION. Another view, making the advantages of the position more apparent.

(d) The Knee-elbow Position.—This position (Fig. 379) permits the abdominal and pelvic organs to gravitate in the direction of the anterior abdominal wall. It is obvious that in certain cases it greatly facilitates the work of discerning exact conditions. This is especially true with respect to suspected adhesions within the pelvic cavity. Thus, a retrodisplaced uterus, with some favoring manipulation, ought to drop back into normal position when the perineum is retracted with the patient in this position. The mobility and attachments of certain growths are determinable by the same means.

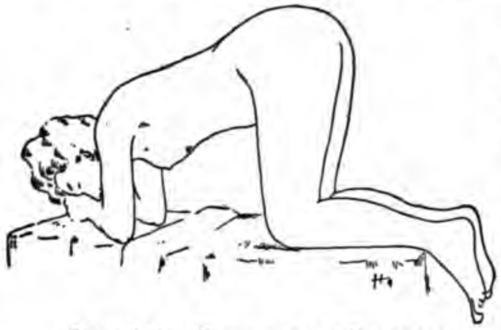


FIG. 379.—KNEE-ELBOW POSITION.

(e) The Knee-chest Position.—This is an exaggeration of the knee-elbow position, and is effected by having the patient already in the knee-elbow position drop her chest to the table on a level with her knees (Fig. 380). It is rather more effective than the latter position in the accomplishment of the same objects.

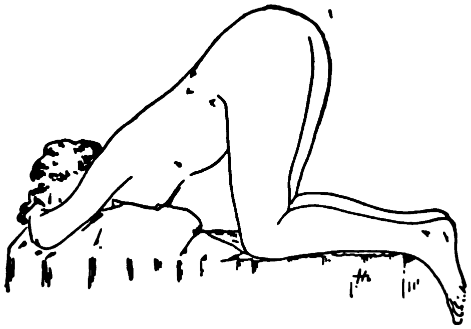


FIG. 380.—KNEE-CHEST POSITION.

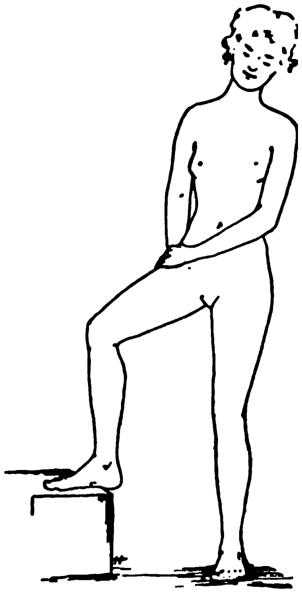


FIG. 381.—STANDING POSITION. Essential for determining the position of the pelvic organs in the most constant attitude of the patient.

(f) The Standing Position.—The woman, standing on one foot, places the other on the rung of a chair or other slight elevation in front of the surgeon (Fig. 381). He thereupon makes a digital and, in certain cases, a bimanual examination. With the patient in this provide himself with one of the so-called self-retaining Sims instruments. It is the simplest and can be held easily by the patient, who will grasp a piece of rubber tubing passed through the fenestrum of the buttock blade.

Sounds and applicators are included in the office outfit, but it is proper to remark that they seldom will be needed. The indiscriminate use of the sound has proved harmful to many women, and it should never be used by unskillful hands. Nevertheless, it will occasionally be serviceable as an aid to diagnosis, hence is included in the list. Applicators, too, will rarely be employed. We need not enter into a discussion of the propriety of topical applications to the endometrium, but it will suffice to say that as a routine it is of doubtful propriety. Occasionally, however, such treatment is needful, hence the instruments must be at hand.

Cystoscopes of both the Kelly and Nitze patterns should be at hand, together with urethral specula and dilators and other necessary accessories.

Rectal specula and sigmoidoscope should be available.

The Douche.—A douche apparatus should be at command for all office examinations or treatment. It should consist of a reservoir that will hold at least a gallon of sterilized water, with rubber tubing attached to a vaginal douche nozzle with backflow arrangement, and the tubing should be equipped with a gate or cutoff. Before examination the woman should be divested of unnecessary clothing, such as corsets and superfluous skirts, then placed upon the table in the dorsal posture, with feet in the foot rests, and the pad or protective properly adjusted to prevent wetting or soiling the clothing. After covering her with a sheet, the douche may be administered. This should consist of an appropriate quantity of sterilized water at a temperature of about 115° F. If there is suspicion of infection the douche should be rendered antiseptic by the addition of bichlorid of mercury sufficient to make a solution of 1 to 2,000.

The Preparation of the Patient.—The preparation of the patient may be made by the office assistant, who should be a competent woman. She should arrange the clothing of the patient, administer the douche, and, if need be, give an enema to unload the rectum. This latter is important if there is constipation, as a distended lower bowel may mislead in diagnosis. Such a condition not only displaces the pelvis viscera, but it may be mistaken for a tumor, new growth, or retroverted uterus. After these preliminaries the patient is ready for the examination proper, which, it is almost needless to add in these days of asepsis, should be conducted with the utmost aseptic care.

The Hands of the Examiner.—The hands of the examiner should

judicious force of his manipulations. With gentleness, one whose sense of touch has become educated may, by palpation, read much that lies under the surface. The kidneys, stomach, and colon especially should be palpated and, if possible, be located by that means. Growths should be outlined and areas of tenderness determined and located.

EXAMINATION BY DIGITAL EXPLORATION

By far the most important method of investigation is the examination by the fingers and hands. The tactile sense is so acute, and may be so highly educated, as to supersede or take the place of every other method, provided one were limited to a single means of obtaining information. It becomes of the first importance, therefore, that it shall be employed intelligently, systematically, and thoroughly. We shall not enter into an argument as to whether the right or left index finger is the better for this investigation, but shall content ourselves with saying that, while the specialist will frequently prefer the left, and most of such at least will be ambidextrous, the general practitioner will usually employ his right finger or fingers for the digital examination. An advantage in using the left finger is that it leaves the right hand free for instrumental use and for bimanual examination. Again, it preserves the right hand from the danger of becoming an infection carrier, which is a matter of considerable moment in dispensary or hospital work. Sometimes it will be useful to employ two fingers in the investigation, but this will be rather the exception than the rule, limited to the capacious vagina and the short index finger. Two fingers in a narrow vagina are, to say the least, painful; but, as the index finger is sometimes short and the diagnostic reach can be increased perhaps half an inch by the conjoined use of the index and second fingers, this expedient occasionally becomes not only justifiable, but useful.

There is nothing that indicates greater gynecological skill than the tactful employment of the digital examination. The clumsy, hasty, and rough manner in which it is sometimes used is to be strongly condemned. On the other hand, it should be employed with the greatest delicacy, but at the same time with thoroughness, precision, and aptitude. Every gynecologist should avail himself of every opportunity to educate his finger tips; indeed, they should be brought to such a degree of tactile perfection that a reasonable degree of accuracy in diagnosis can be obtained, in the majority of cases, without an appeal to instrumental aid. The digital examination becomes available and applicable in the horizontal, dorsosacral, lateroprone, genupectoral, and standing postures. But its chief application is in the dorsal or dorsosacral postures. Finally, the index finger occasionally becomes of great usefulness in everting the anus by pressure through the vagina upon its posterior wall. In this manner the examiner will often detect with ease and precision rectal or anal faults that otherwise might remain obscure.

The index finger of the "handy" hand, right or left—and, in the absence of special necessities, the index finger only is to be employed. The routine use of two fingers for examination is an evidence of poor training and lack of skill on the part of the examiner. The procedure as defined by Potter is as follows:

194. POTTER PROCEDURE FOR DIGITAL EXAMINATION OF THE VAGINA

(1) The finger tip, palmar surface downward, should be carefully passed into the vagina, against its posterior wall, the fingers of the other hand being used to separate the labia and slightly to distend the vulvar orifice.

(2) In this manner it will note, first, the condition of the perineum, its rigidity or laxness, its integrity or imperfectness; secondly, the condition of the rectum, whether it contains feces or is empty; thirdly, the relation of the coccyx to the pelvic outlet; and, fourthly, the capaciousness or narrowness of the vagina.

(3) Turning now the finger upward, and passing from side to side along the vagina, its lateral surfaces are explored.

(4) Then the cervix uteri is reached. Here is an important field for investigation. If the cervix is soft, like the lips, a suspicion of pregnancy will arise; if firm or hard, like the nose, such suspicion, if it exists, will be dispelled.

(5) The cervix and os must now be carefully examined with reference to size and form and direction of the cervix, and the presence or absence of lacerations or new growths in the os. The importance of thoroughness with reference to this portion of the examination is to be insisted upon, and an educated finger tip is essential to its completeness.

(6) The anterior wall is next explored, noting the condition of the bladder and urethra.

In cases of girls and unmarried women a vaginal examination, either digital or instrumental, should be undertaken only in the presence of positive indications. Youth and virginity should always be looked upon as contraindications for such an exploration, unless in the presence of distinctly counterbalancing reasons, such, for instance, as the presence of all the menstrual phenomena, the flow excepted, suggesting the possible retention of the menstrual fluid; or in the presence of an offensive discharge associated with remoter pelvic symptoms; or to investigate the origin of a persistent hemorrhage. There are numerous other conditions, the importance of which will occur to the practitioner. It should be set down as a rule, to which there are but few exceptions, that the examination of young girls in particular and of many unmarried women of the nervous type should be undertaken only under anesthesia. In this way alone they can be protected from a serious moral shock and more or less physical discomfort. When the examination is being made great care should be taken to preserve, as far as possible, all virginal conditions; but this consideration ought not to obtain to the point of defeating thoroughness of exploration in the presence of manifest necessity.

In married women less hesitancy should be manifested in undertaking an examination, although even in such cases it should not be done for trivial reasons. When, however, there are either pudendal, vaginal, or high pelvic symptoms of an obscure character, and sufficiently severe to justify treatment at all, the practitioner owes it both to himself and his patient to insist upon an examination. Any failure to take this stand is liable to be disastrous to both parties.

In women past the menopause all symptoms of a pelvic character should be regarded with suspicion and inquired into with promptness and precision. This is especially true in the presence of hemorrhage at or about the period of the change of life—a symptom which is nearly always an evidence of malignant disease.

195. PROCEDURE FOR EXAMINATION BY BIMANUAL MANIPULATION

The bimanual method of exploration may be defined as the examination of the pelvic contents by the two hands, the index finger—not two fingers—of one being in the vagina, and the other placed on the abdomen above and beyond the pubes, with which to make downward pressure (Fig. 384). The finger within the vagina lifts up the organ or organs, and the finger tip of the other hand, pressing downward upon the relaxed abdominal walls, engages it or them between the two. Beginning first with the bladder, its sensitiveness, distention, or emptiness is noted. Passing upward to the uterus, its size, condition as to firmness or softness, and its position, whether in anteflexion, retroflexion, or prolapsus, are determined.

The information to be derived from the bimanual method of examination may be grouped as follows:

(1) Capacity, rigidity, and tonicity of the vagina.

(2) As to pregnancy, *pro* or *con.*

(3) The condition of the bladder and its relation to the other pelvic organs.

(4) The uterus, its size, position, presence or absence of tum within its walls, and the condition of the cervix as to integrity lacerations.

(5) The status of the tubes and ovaries as to size, location, a relationship to neighboring parts.

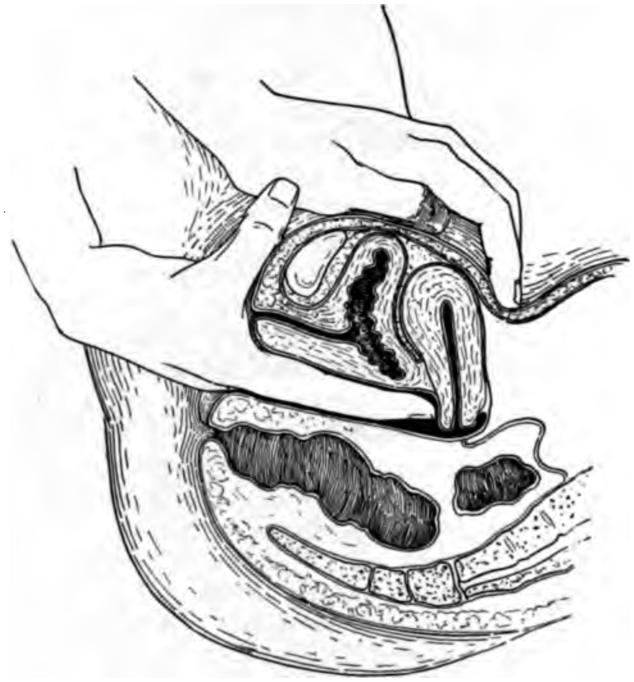


FIG. 384.—(195) PROCEDURE FOR BIMANUAL EXAMINATION OF THE PEL ORGANS, WITH THE PATIENT IN THE DORSAL FLEXED POSITION.

(6) The condition of the rectum as to fecal impaction or dise of any kind, such as fistula, fissure, cancer, or hemorrhoids.

(7) As to the presence of any abdominal or pelvic tumors, n growth, extrauterine pregnancy, or any abnormal condition not embra in the foregoing classification.

(8) It may be remarked that in the case of tumors the biman examination affords opportunity to distinguish between cystic and so growths, and, to a certain extent, between benign and malignant n plasm.

EXAMINATION OF THE VAGINA AND UTERUS BY INSTRUMEN

The office armamentarium should be simple, and such instrume as are chosen should be models of perfection. It should never be gotten, also, that instrumentation, no matter how dexterously applied, can never be made to supplant the educated hands and finger tips. Instruments at most are but supplementary aids to intelligent hands and fingers. We may, however, enumerate some of the instruments which are considered a necessity by the gynecologist. These are: (1) the speculum, (2) the sound or probe, (3) the dilator, (4) the curette, (5) the cystoscope, (6) the aspirator with exploratory needles, (7) the stethoscope, (8) the uterine dressing forceps, (9) the spatula or depressor, (10) the tenaculum, (11) the volsella.

The Speculum.—Since Sims gave to the profession the speculum which bears his name the practice of gynecology has become an established specialty. Without this device it is doubtful if gynecology could have been enlarged, broadened, developed into the importance which it has attained at the present day. Dr. J. Marion Sims, then residing in the city of Montgomery, Ala., was engaged between the years 1845 and 1849 in the study of the operative treatment of vesicovaginal fistula. During his investigations he accidentally discovered that if a woman was placed upon her knees and chest, upon separating the labia the air would enter the vagina and distend it to its full capacity. What was needed was an instrument to retract the perineum. This he supplied first with a spoon handle bent to the appropriate shape, and afterward, as the product of evolution, came the present speculum, which universally bears the name of Sims (Fig. 385). In the further pursuit of his investigations, and for the appropriate use of his speculum, a less trying posture was needed than the knee-chest. This led to further experimentation, from which was evolved the semiprone or Sims position (Fig. 378). It is sometimes called the lateroprone posture, but, by whatever name it is known, its discovery and practical application are due to Marion Sims. The Sims speculum and the Sims position form the basis of the science of gynecology as at present understood and practiced. Whoever, then, would attain success in the art must not only familiarize himself with the principles of this instrument and its correlative posture, but he must acquire deftness in their practical application to the patients who consult him.

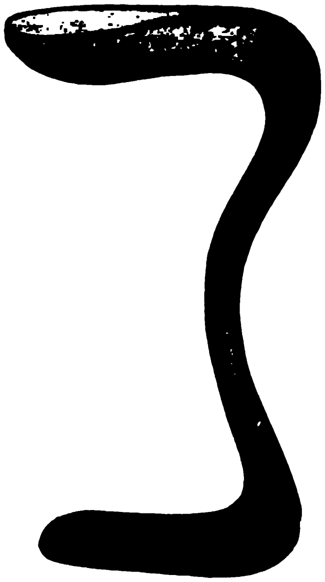


Fig. 385.—Sims Speculum.

The beginner, therefore, should address himself to the mastery of the use of the Sims speculum in the semiprone or Sims position. The principles are simple and the obstacles to be overcome are few. It is a mistake to suppose that a long experience is necessary to attain proficiency in the use of the speculum. It is another mistake to presume that a trained assistant is necessary to its advantageous employment. The physician himself must be the expert; he can then easily instruct any intelligent person to hold the speculum properly. These examinations, for obvious reasons, should be conducted in the presence of a third person. A gynecologist of large practice has an office assistant who performs this service. A physician whose gynecological practice is limited may either avail himself of some member of his household in office examinations, or employ the Sims-Emmet self-retaining speculum.

Before leaving the subject of the speculum it is proper to state that the essential requirements for the successful use of the Sims instrument are, first, the correct position of the patient, and, secondly, the proper holding of the instrument. The semiprone posture cannot be described in words with sufficient clearness for a novice to understand it; moreover, it is difficult to illustrate it clearly, hence it is advised that a physician unfamiliar with it should place himself under the instruction of a person who understands it thoroughly.

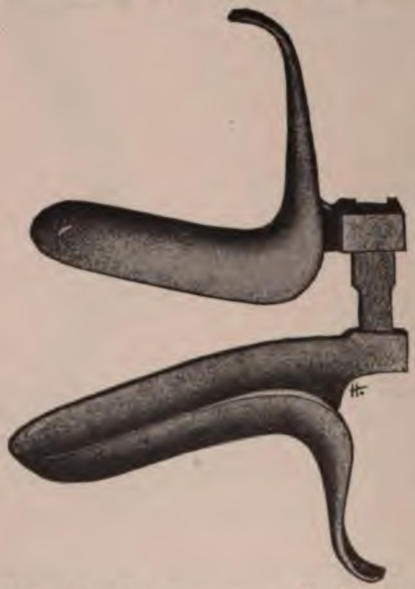


FIG. 386.—GAU SPECULUM. Each blade can be used as a Sims speculum, or both as a bivalve.

Besides the Sims speculum, it is well to have at hand a good bivalve, like Miller's or Gau's (Fig. 386), which gives a good view of the cervix (Fig. 388), as well as a trivalve, the latter according to Nott's model (Fig. 387). It occasionally becomes necessary to examine the os or cervix uteri in the dorsal position, and these specula are well adapted to that purpose (Fig. 388).

In the use of the speculum it is sometimes desirable to use reflected light or the intense rays of an electric illuminator. In cases of erosion of various character material assistance in diagnosis may be derived from the use of a magnifying glass, like that devised for the pur-

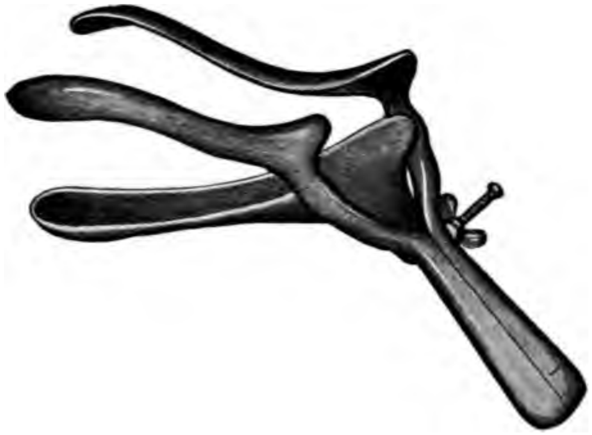


FIG. 387.—NOTT TRIVALVE SPECULUM.

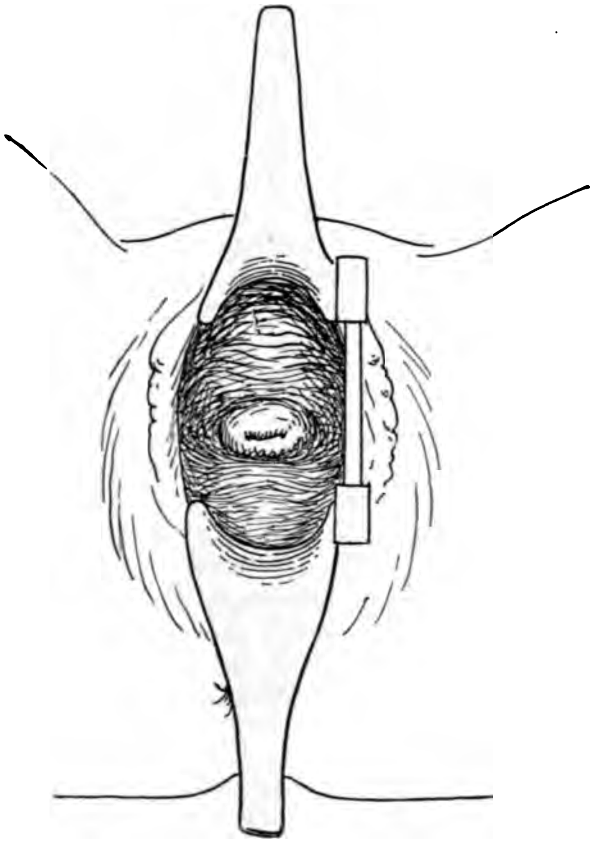


FIG. 388.—GAU SPECULUM USED AS A SELF-RETAINING BIVALVE

pose by Dr. Alexander Duke, or Cheltenham. The lens, called a hysteroscope, is so arranged on a hinge that it can be placed at an angle by the observer. By this means the light can be directed with accuracy upon the parts under examination, and, when used with artificial light, it acts both as a condenser and a magnifier (Fig. 389).

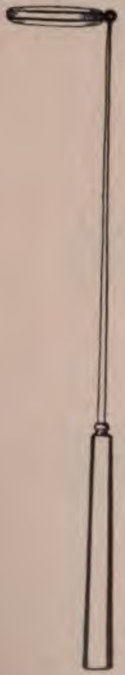


FIG. 389.—DUKE HYSTEROSCOPE

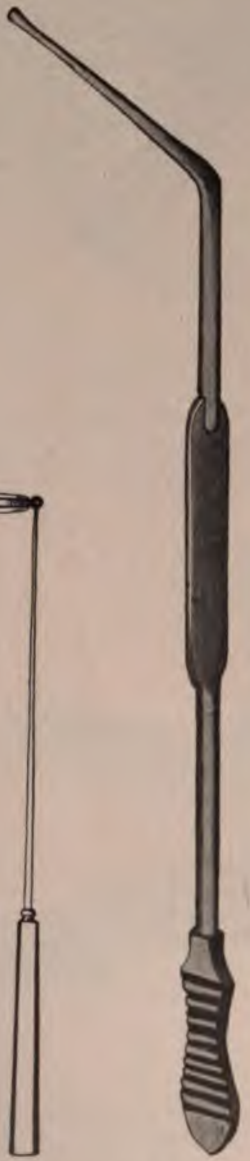


FIG. 390.—ROSS UTERINE SOUND.

The Sound.—Formerly the sound was considered an essential part of the gynecological armamentarium, because almost the first thing done after the introduction of the speculum was to pass the sound into the uterus. Nowadays, however, with improved methods of diagnosis, and especially through a more thorough understanding of the bimanual examination, the sound rarely is needed. Its chief purpose is to confirm the diagnosis in doubtful cases, such as intrauterine growths and other intrapelvic abnormalities that are misleading in their character. The dangers of the sound consist in its liability to carry infection within the genital tract, and to puncture the uterine wall; the latter is, comparatively speaking, an inconsiderable danger, whereas the former is a very grave one. The sound devised by J. F. W. Ross (Fig. 390) is best designed to obviate all dangers. The sound is no longer used by the experienced gynecologist to reposit a displaced womb, and, whenever it becomes necessary to use it as an aid to diagnosis, first, it should be made thoroughly aseptic, and then it should be dipped in pure carbolic acid, rendered liquid by the addition of five per cent. of glycerin, before it is passed into the uterus. With this precaution, and with gentleness in manipulation, the sound may not do harm, and possibly it may serve to clear up a doubtful diagnosis. The probe is only a modified sound, lighter in construction, and much more flexible, and practically is used for the same purpose. Applicators, either of whalebone or aluminium, are useful in carrying certain medicinal applications within the uterine canal. If, however, the uterus is sensitive from inflammation, the use of the sound, probe, or applicator is contraindicated, although in some instances where information is urgently needed a very light probe might possibly be introduced without harm. The rule should be *never* to pass the sound or probe unless it can be used without causing pain.

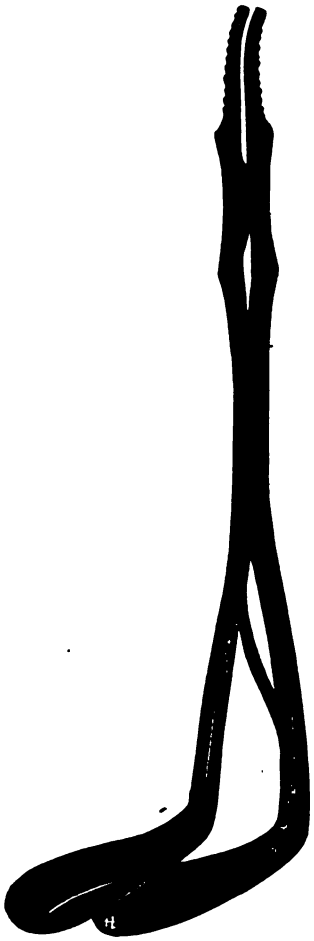


FIG. 391.—GOODELL DILATOR.

The Dilator.—Dilatation of the uterus is accomplished by graduated bougies, by metal dilators having divergent blades, by tents, or by rubber bags to be filled with air or water. The usual method is through the medium of the hard rubber graduated bougie, or the mechanical steel dilator of Goodell (Fig. 391). The purpose of dilatation is to make the endometrium accessible to certain therapeutic measures, either medicinal or instrumental. In a narrow or pinhole os it becomes necessary to dilate the channel before using the curette or making applications to the endometrium. Where but little dilatation is required occasionally the glove stretcher or metallic dilator can be used without an anesthetic; but usually, when it becomes necessary to employ the more complicated instrument of Goodell, anesthesia to the surgical degree should precede its use. When the os is patulous curettage for diagnostic purposes may be made sometimes without resorting to anesthesia. Diagnostitial dilatation often becomes necessary for the purpose of admitting the finger into the uterine cavity. It is necessary to surround this operation with all the precautions that pertain to formidable procedures. It is not to be done in the consulting room, and the patient allowed to make her way homeward afterward, but it should be done either in hospital or at home, in order that the patient may be kept entirely quiet for the next few days thereafter. This operation is to be preceded by the seizure of the anterior lip of the cervix by the volsella or strong tenaculum. The cervix is thus stretched and the dilator gradually and slowly passed into the cervical canal, the bougie with a rotary motion, the glove stretcher with a spreading of the blades in a gentle manner, just within the os, advancing a little farther and stretching again, and so on until the work is completed.

The Curette.—This instrument is used to obtain scrapings from the endometrium with a view to determine the nature of any disease that may not otherwise be explained. These scrapings may be submitted to examination by the microscope. If malignancy is ascertained the further method of procedure is readily pointed out. If there are remains of an abortion, or an endometritis that has followed abortion, then the interior of the uterus should be thoroughly cleaned, mopped with pure carbolic acid, or carbolic acid and iodin, and the organ should be packed with antiseptic gauze. The curette is often used unnecessarily, and great caution should be observed in its employment. The puerperal womb is easily perforated, an accident that has often happened in unskillful hands.

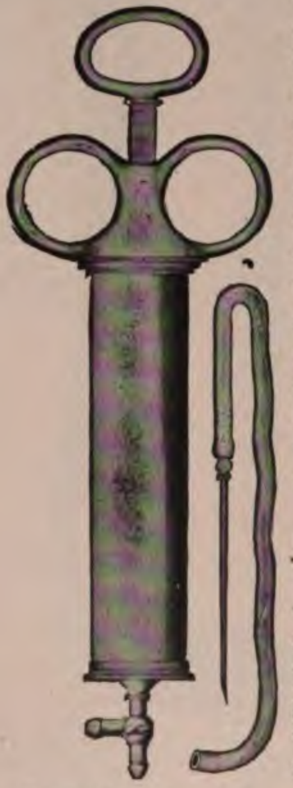


FIG. 392.—ASPIRATOR.

The Aspirator.—This instrument is sometimes used for diagnostic purposes. It is occasionally appealed to, for instance, when cysts or pus pockets develop along the broad ligament. In doubtful cases these sacs may be explored through the roof of the vagina, but it is generally sufficient to diagnosticate them by the usual means, and to evacuate them by surgery through the abdomen or vagina.

The Stethoscope.—The stethoscope is occasionally employed to ascertain the nature of abdominal diseases, especially when pregnancy is suspected. The uterine dressing forceps and the depressor are an essential accompaniment to the armamentarium, and need no particular description. The forceps carries cotton in wiping the tract, and the depressor holds the bladder away from the field during inspection. The tenaculum and volsella are used to seize the lips of the uterus in order to draw down the organ or to steady it while the parts are being inspected and applications are being made. These instruments should be dipped in pure carbolic acid before using.

EXAMINATION OF THE URETHRA

The urethra should be carefully examined whenever it is the probable seat of symptoms. This is done by both inspection and instrumental exploration. The meatus urinarius should be inspected with the vulva. If there is any indication in the history of the case for so doing, a sound or catheter may be passed. This should be done carefully to determine the existence of hyperesthetic zones, and the presence of slight strictures, which are very common in women. A urethral speculum may be introduced to expose the mucosa in the lower half of the canal. Skene's ducts, the ostia of which lie one on either side just within the meatus, should be carefully explored by inspection and by a small probe to determine whether or not they are responsible for persistent infection. Urethral growths can thus be located. The urethra can be safely dilated for purposes of examination by the use of Kelly's conical dilator (Fig. 393), the method of using which is shown in Fig. 394.

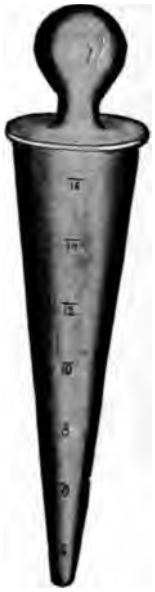


FIG. 393.—KELLY CONICAL URETHRAL DILATOR.

EXAMINATION OF THE BLADDER

The bladder may be examined by (a) the sound, (b) the cystoscope, and (c) the finger.

(a) The sound may be employed to determine the condition of the outlet, the condition of the wall, as in cystocele, upward distortion, as in certain tumors, and occasionally in pregnancy. The presence of papillomata and other growths is presumptively indicated by the occurrence of hemorrhage following careful exploration with the sound.

(b) The cystoscope is of two varieties, viz., (1) the Kelly urethrovesical speculum, and (2) the Nitze-Otis instrument for electrical illumination and inspection of the interior of the bladder.

196. PROCEDURE FOR THE EXAMINATION OF THE BLADDER WITH THE KELLY CYSTOSCOPE

(1) With the patient on her back, the bladder being empty, the urethra is injected with a 5 or 10 per cent. solution of cocain, introduced by means of a pipette.

(2) Five minutes later the patient is placed in the knee-chest position (Fig. 380).

(3) The meatus and urethra are stretched to the required size by the use of the conical dilator (Fig. 394). This should be done gently, with a boring motion, and with the cone well lubricated with sterile vaselin, until the twelve-millimeter mark is reached.

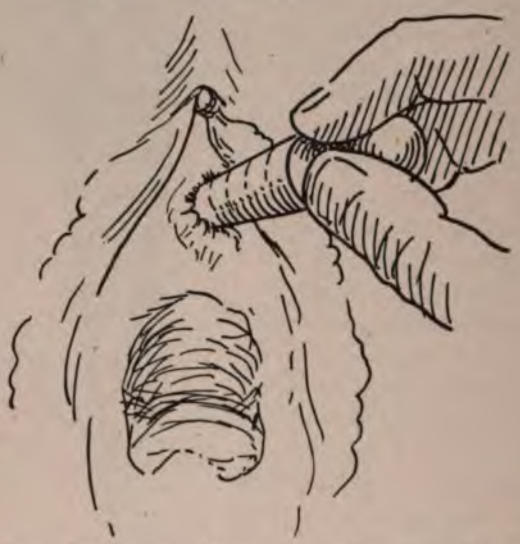


FIG. 394.—(196) METHOD OF USING THE KELLY CONICAL DILATOR, WITH THE PATIENT IN THE KNEE-CHEST POSITION.

(4) The speculum (Fig. 395) is introduced with due reference to the curves of the urethra around the pubes (Fig. 396).

(5) (a) Inspect the bladder wall generally by pointing the speculum in various directions; (b) examine for stone or other foreign body; (c) examine the anterior wall by forcing it up with the other hand above the pubes; (d) examine the trigone and the orifices of the urethra.

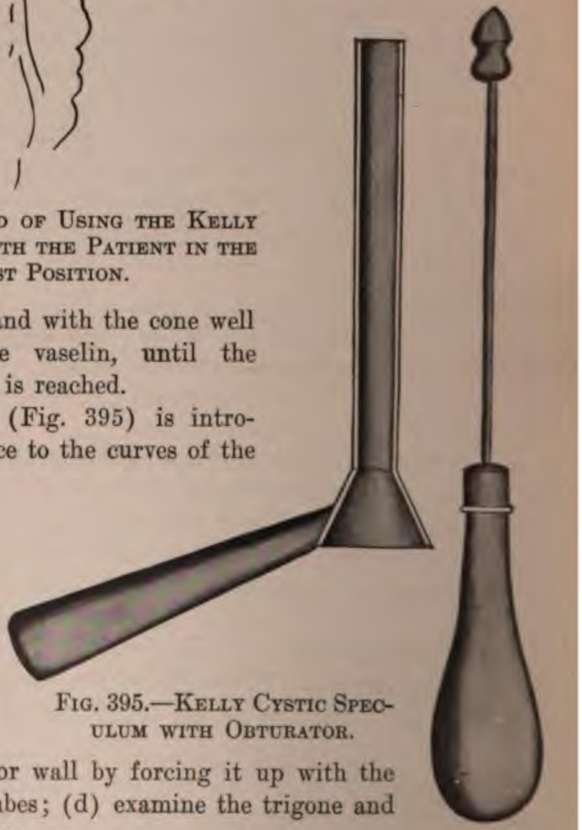


FIG. 395.—KELLY CYSTIC SPECULUM WITH OBTURATOR.

An instrument of utility in helping to make this examination is the mouse-toothed forceps (Fig. 397).

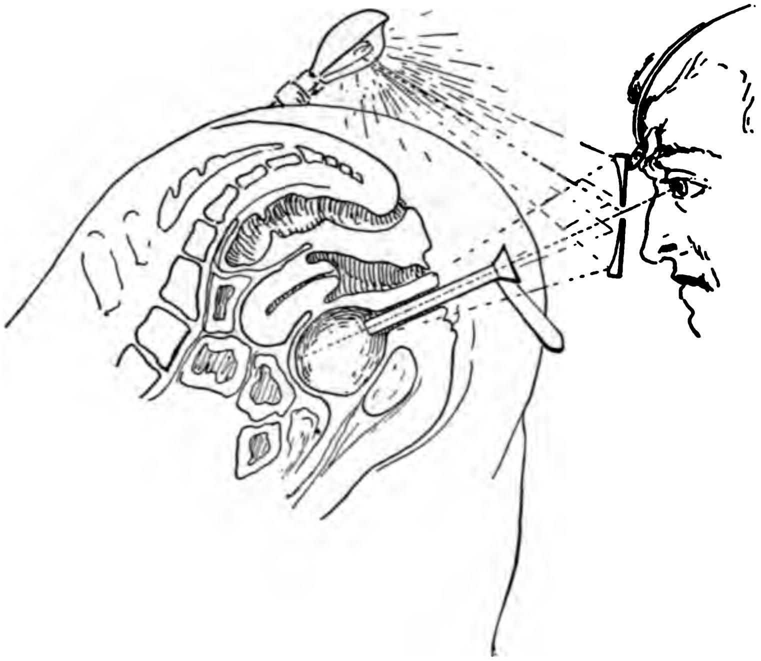


FIG. 396.—METHOD OF USING THE KELLY CYSTIC SPECULUM.

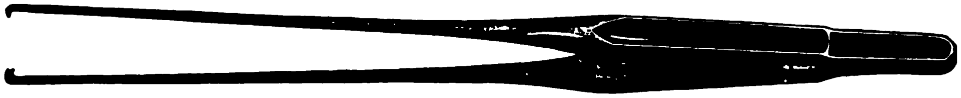


FIG. 397.—MOUSE-TOOTHED FORCEPS.

197. PROCEDURE FOR EXAMINATION OF THE BLADDER BY THE NITZE-OTIS CYSTOSCOPE

(1) The bladder is emptied and the urethra anesthetized with a 5 or 10 per cent. solution of cocain.

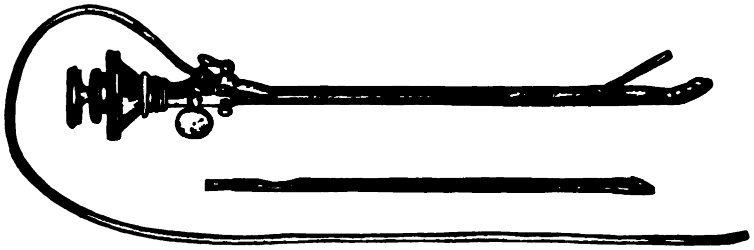


FIG. 398.—A CYSTOSCOPE WITH ATTACHMENT FOR CATHETERIZATION OF THE URETERS.

(2) If the urine is very turbid the bladder is washed out with normal salt solution until it comes away clear.

(3) The bladder is then filled with normal salt solution.

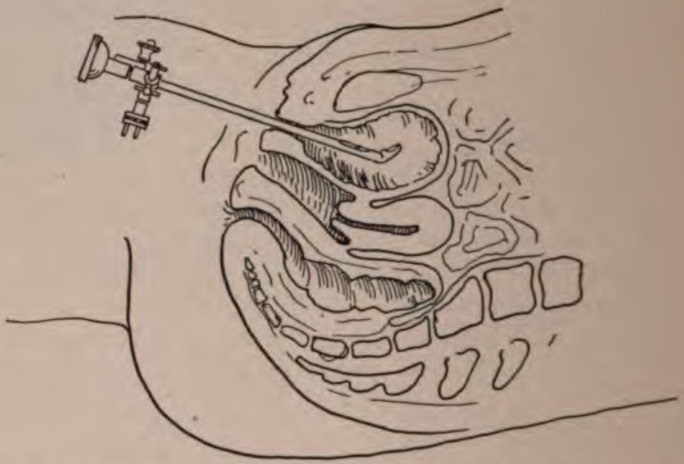


FIG. 399.—(197) METHOD OF INSPECTION BY NITZE CYSTOSCOPE.

(4) The instrument (Fig. 398) is introduced just as a sound is introduced (Fig. 399).

(5) To insure completeness of inspection the same rule (Pro. 196, No. 5) should be adopted as in the examination with the Kelly instrument.

EXAMINATION OF THE URETERS AND KIDNEYS BY CATHETERIZATION

This may be accomplished either (1) by the Kelly or (2) the Nitze-Otis instrument.

198. KELLY PROCEDURE FOR CATHETERIZATION OF THE URETERS

(1) With the patient in the knee-chest position the urethrovesical speculum is introduced, as previously described.

(2) The speculum is withdrawn until the internal end of the urethra begins to fold over it.

(3) Now, by pushing it straight in for a distance of about 1 centimeter, and then deflecting it laterally about 25° or 30°, the ureteral orifice usually comes into view. This has the appearance of a small narrow slit, a slight elevation or papilla, or sometimes of a small fold in the mucous membrane.

(4) If the ureteral orifice does not readily present itself after the end of the speculum has been directed to the location where it presumably ought to be, it may be sought for with the searcher.

(5) When found it should be carefully wiped off with a piece of cotton wet in boric acid solution, and the catheter gently introduced. If desired the speculum may be withdrawn, the patient turned on the back, and the catheter allowed to remain until sufficient urine has been collected for analysis.

The chief advantages of this method are that the instruments necessary are simple and inexpensive, and that it permits cleansing of the ureteral orifice by direct application before introducing the catheter. The method, however, is not so simple as it appears. Much practice and dexterity are necessary, and numerous failures will be recorded by the occasional user. Besides, an anesthetic is often necessary in order to secure perfect ballooning of the bladder, when two trained assistants or a special apparatus will be required to hold the patient in position.

199. NITZE PROCEDURE FOR THE CATHETERIZATION OF THE URETERS

By this method the catheter is introduced into the ureter under the guidance of the eye by means of one of the ureterocystoscopes, such as Casper's, Nitze's, Albarran's, Brenner's, etc. (Fig. 398).

(1) The bladder is thoroughly cleansed by irrigation, and about 100 to 150 cubic centimeters of clear boric acid solution allowed to remain in the bladder.

(2) The cystoscope, properly sterilized, is then introduced, and the interior of the bladder illuminated by the electric light.

(3) The ureteral orifice is located by inspection.

(4) When found, the catheter, passed along the small canal in the instrument, is directed toward, and made to enter, the ureter by the sense of sight.

(5) The ureteral catheters may be left *in situ,* if desired, the boric solution drained off through the cystoscope, which is then removed.

EXAMINATION OF THE URINES BY SEGREGATION

In consequence of the great advance which has been made in the study of pathologic conditions of the genitourinary tract, and in view of the fact that the urine secreted by either kidney differs from that secreted by the other, it is now important to speak not of the urine, but of the urines, when reference is made to the secretions which accumulate in the bladder. The investigation of the blended urines, however, is still a matter of clinical importance. Care should be taken to determine their quantity, color, and specific gravity, the presence or absence of albumin, glucose, mucus, tube casts, pus, or other morbid products. In view of the importance of xanthin and the paraxanthins in the causation of various nervous phenomena, an examination of the urine will frequently need to embrace a qualitative and quantitative determination of these substances. Urea and uric acid are of clinical importance and

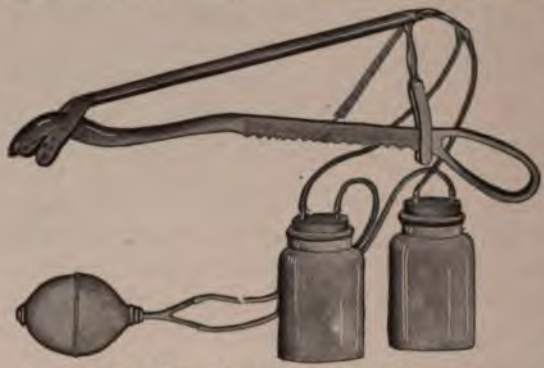


Fig. 400.—The Harris Urine Segregator.

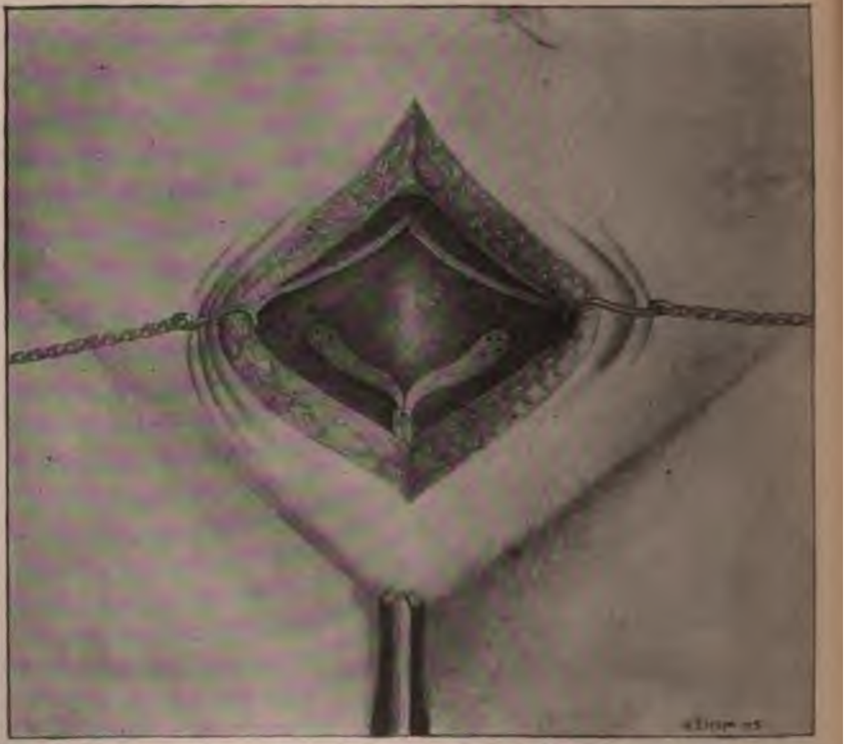


Fig. 401.—The Harris Urine Segregator in Situ, Showing How the Urines are Collected Separately from Each Kidney without the Ureters Being Entered.

need to be studied. In many cases it will be important not only to study the urine from each kidney, but also to study each urine and the blended urines repeatedly. To insure completeness of examination it is important to follow the usual blanks available for the purpose.

The segregation of the urines is accomplished (1) by catheterization of the ureters, and (2) by the use of the Harris urine segregator (Fig. 400). By this instrument the urines are collected separately from each kidney without the ureters being entered (Fig. 401).

200. HARRIS PROCEDURE FOR THE SEGREGATION OF THE URINES

(1) The patient is placed on the back in an easy lithotomy position, with the hips on the same level as the shoulders.

(2) The bladder, after being thoroughly cleansed by irrigation, is distended with about 150 cubic centimeters of sterile water.

(3) The double catheter, sterilized by boiling, is introduced into the bladder and the lever into the vagina.

(4) After these two pieces are locked by means of the small pin in the forked piece, the catheters are opened and fastened by means of the small spiral spring.

(5) The rubber tube connecting the curved tips of the catheter is now removed and the water within the bladder allowed to escape.

(6) The vials are attached, and, by means of the most gentle action of the bulb, the urine will be found to collect in the vials, right and left, respectively, as fast as it escapes from the ureters.

Each of these methods has its advantages. By means of the cystoscope the interior of the bladder may be accurately inspected, and local conditions, such as inflammatory changes, ulcers, incrustations, new growths, etc., recognized. By catheterization of the ureters the urine may be collected and the pelvis of the kidney drained and then treated by irrigation. The use of ureteral bougies will often enable one to recognize the ureter more readily in certain operations in the pelvis, or to locate the divided ends of an injured ureter. One may be able to detect the presence and location of a stricture or obstruction of the ureter, possibly to dislodge a calculus from the ureter, and rarely to detect a calculus in the pelvis of the kidney. The great disadvantage of the ureteral catheter is the danger of infecting a healthy ureter and kidney. This danger is so real that, in the presence of a septic bladder, or in tuberculosis of the bladder or of one kidney, a healthy ureter should never be catheterized except under the most urgent necessity.

The great advantage of the urine segregator is that it may be used without danger of infecting a healthy kidney, even if the bladder is septic, as the instrument does not enter the ureteral openings.

EXAMINATION OF THE RECTUM

201. MARTIN PROCEDURE FOR NON-INSTRUMENTAL PROCTOSCOPY

"The essentials of this method," says Martin, "are a patient, an assistant, and an operator having at least one finger on each hand." His description of the procedure is as follows:

(1) The patient is to be put into the knee-chest posture; the assistant is to place and to hold the patient; and the surgeon's fingers are to be used to open the anus, all in the following manner, viz.:

(2) The patient is to be completely anesthetized as she lies on her back, and then turned toward the assistant and into the Sims posture.

(3) The assistant is to station himself at the patient's knees. In his left hand he is to grasp the patient's feet. He is to lean himself against the patient's knees. He is to pass his right arm under the patient's hips. Now, steadying the feet and bearing himself firmly against the patient's knees, with his right arm he is to lift the hips and pull his subject into the knee-shoulder posture.

(4) Here, securely held in the embrace of the assistant, the patient is to be balanced on her perpendicular right thigh, where, throughout the whole time of the surgeon's manipulations, she must be steadily held.

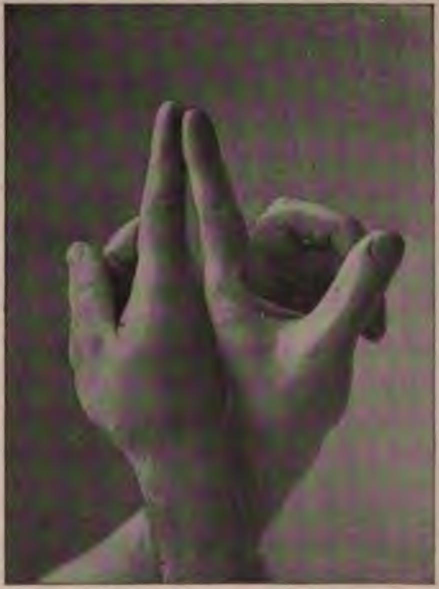


FIG. 402.—(201) MARTIN PROCEDURE FOR NON-INSTRUMENTAL PROCTOSCOPY. (a) Method of arranging the fingers for introduction.

(5) The surgeon is to close his hands and to point his index fingers.

(6) The wrists are to be crossed, the hands placed back against back, and the nails of the index fingers placed one against the other (Fig. 402).

(7) The surgeon is to lubricate these fingers and gently insinuate them through the anus, and place their ends beyond the borders of the levatores ani.

(8) This accomplished, the anus is to be kneaded and divulsed in the direction of the ischial tuberosities, by the surgeon forcibly parting his fingers, as is shown in the accompanying illustration (Fig. 403). Under this manipulation the rectum becomes atmospherically inflated.

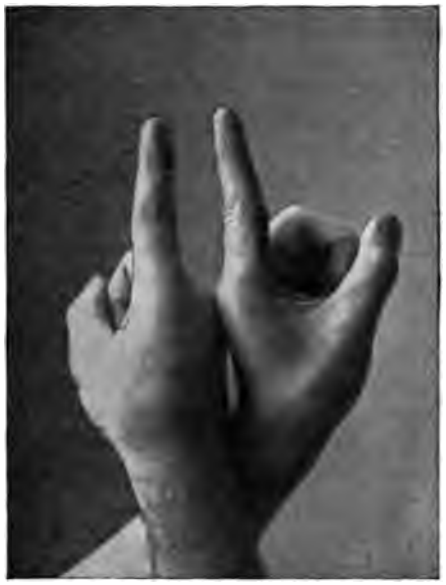


FIG. 403.—(201) MARTIN PROCEDURE FOR NON-INSTRUMENTAL PROCTOSCOPY. (b) Method of separating the fingers after introduction.

(9) Now, provided the surgeon lowers his head to the level of his fingers and then rises again, or stoops, or moves a little from side to side, he may command under his eye a view of the atmospherically inflated rectum to the depth of 6 or 8 inches (15.24 or 20.32 centimeters), and, in some instances, he may behold even a part of the sigmoid flexure. It is possible for the operator to manipulate his patient and to finish his inspection within two and a half or three minutes, provided the patient is in a state of complete anesthesia.

If this method is practiced, as it may be with facility by the general practitioner, the greater number of rectal diseases may be instantaneously diagnosticated. But at diagnosis the achievement of the simplest proctoscopy ends, for the reason that the operator's hands are so full of his patient he can do nothing at all for the disease that he may have discovered.

In some conditions and under some circumstances the rectum will not become inflated. If there is a close stricture of the rectum, if there is malignant growth or other disease of the rectum, by means of which the gut's coats have become extensively filled and fixed with an organized plastic exudate, if for some reason the intraabdominal pressure is abnormally increased, as it may be by the bearing down of the patient, by enormous intestinal flatus, or by ascites, or if there is an impinging uterus, an extrarectal growth, or extensive infiltrating disease of the contiguous textures, rectal inflation by this method, or by any other method which is governed by the same principle, is a physical impossibility. But this need not baffle the man bent on seeing by instrumental aids.

Practiced as described, when not embarrassed by the exceptions specified, this method will achieve its purpose and reveal to the surgeon that the transverse diameter of the rectum is variable.

The rectum may present to the eye of the imaginative observer the appearance of a chain of urinary bladders, communicating one with another by means of irregularly elliptic openings set at varying axes, and bounded by the non-parallel borders of the rectal valves. In the normal rectum the air pressure smooths the mucous membrane evenly over the entire surface of the gut. The normal mucous membrane of the so-called ampulla appears at first wet and of a shining bluish-gray. As it dries, under the influence of gravitation the blue venous tint fades out of the gray, and the wall becomes pink-tinged; presently it assumes the appearance of parchment, and sometimes it appears painted at rare intervals with ramifying little arteries which are crowded and overlapped by the larger companion veins; the latter are less arborescent and more suddenly dive and disappear in the bowel wall. In time there comes a sheen over all, and the vascular pictures fade. These phenomena appear exactly as described only in the healthy rectum; in the diseased organ the color varies much.

Should the operator deviate from the prescribed directions for the manipulation of his fingers, and so twist his hands as to divulse the anus in the anteroposterior direction instead of laterally, he invites defeat upon himself; for in the male the fixation of the perineum and the immobility of the coccyx interfere with the requisite dilatation; while in the female the extreme mobility of the perineum, and particularly the backward displaceability of the coccyx, will allow such traction to be made upon the levatores ani as to pull their inner borders parallel and almost together; and, in consequence, the wider the female's anus is opened anteroposteriorly the closer it shuts laterally to rob one of one's view.

202. MARTIN PROCEDURE FOR INSTRUMENTAL PROCTOSCOPY

A short rectal speculum (anoscope, Fig. 404) and a longer rectal speculum (proctoscope, Fig. 405), a chair susceptible of various movements, and dressing forceps are required.

Special preliminary preparation of the patient is ordinarily not required, as the usual condition of the rectum is that of emptiness. In some cases, however, it facilitates the inspection if the patient employs rectal lavage an hour before the examination.

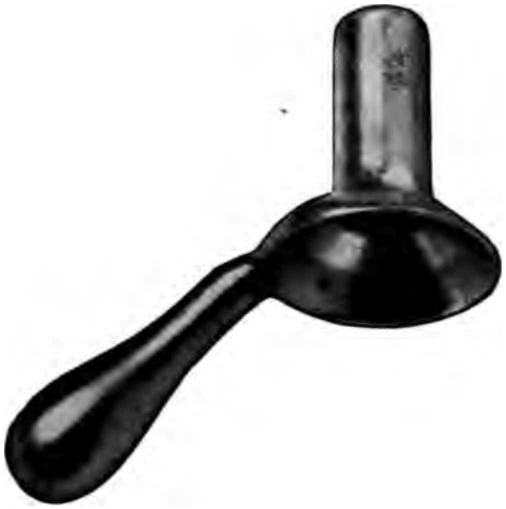


FIG. 404.—THOMAS CHARLES MARTIN'S ANOSCOPE.

Step I.—(1) The patient should be required to sit on the operating chair with her body turned to the left and facing the knee-board. The right knee should be crossed over the left knee, the left arm should embrace the right border of the chair-back, or it may be folded at the side, as for Sims' posture. The small pillow should be held in the patient's right hand and against and upon her left shoulder (Fig. 406).

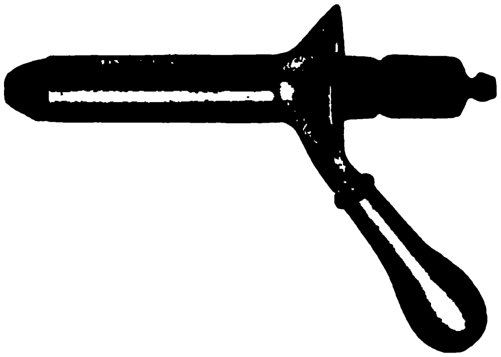


FIG. 405.—THE MARTIN PROCTOSCOPE WITH NOTCHED AND HOLLOW OBTURATOR IN POSITION.

Step II.—(1) The chair is changed to the horizontal position and the light fixture adjusted (Fig. 407). This movement brings the patient into Sims' semiprone-semiflexed posture without requiring any movement whatever on the part of the patient after she is properly seated. In this posture the external anus and fixed rectum are to be examined.

(2) Digital and ocular inspection should now be made of the anal verge, the external anus, and the superficial ischiorectal space at a moment when the patient is relaxed, and again when she is bearing down.

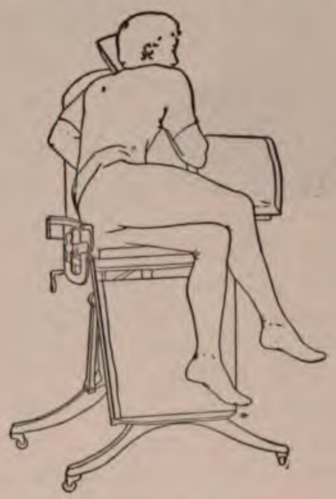


Fig. 406.—Position No. 1. The patient should be required to sit on the operating chair.

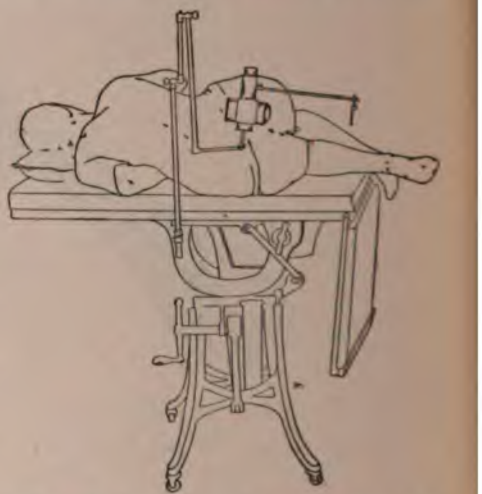


Fig. 407.—Position No. 2. The chair changed to the horizontal position.

(3) Digital examination of the fixed or anal rectum also should be made a preliminary to the introduction of the anoscope.

(4) The anoscope should be gently pressed into the anus in the direction of its axis till the sphincters relax to receive it. The introduction of the instrument may be much facilitated by holding its lubricated end against the sphincter and requiring the patient to bear down; bearing down expands the anal sphincter, relaxes the levator ani, thins the pelvic floor, or shortens the fixed rectum, and presses the rectal sphincter over the instrument; in other words, the patient's anus is made to climb down upon the instrument.

(5) After the introduction of the anoscope, its obturator should be removed and the inspection made. The observations should be made coincident with the withdrawal of the anoscope. In instances of ex-

tremely sensitive ani hypodermic injection into the sphincters of 10 or 20 minims of one-tenth of one per cent. solution of cocain will render anoscopy painless.

Step III.—(1) The shoulder strap should be placed and fixed to the chair, the knees should be drawn up so that the thighs are at a right angle to the length of the chair-top, and the chair should be tilted (Fig. 408) to the extreme lateral position (Fig. 409). The leg footboard should now be lowered and the operator's stool placed in position. The illumination apparatus should next be adjusted as illustrated. In this new posture, which is equivalent to the knee-chest posture, the abdominal rectum is to be examined.

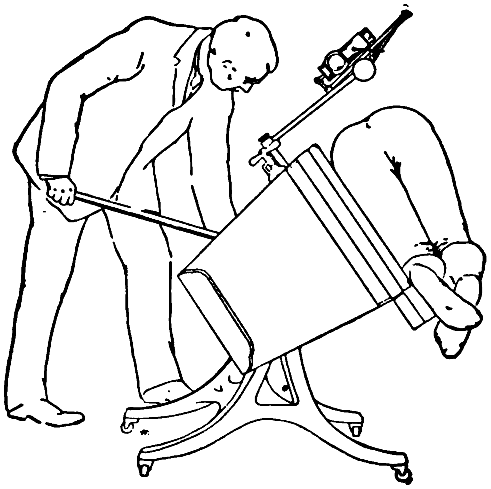


FIG. 408.—POSITION NO. 3. The chair should be tilted.

(2) Introduction of the proctoscope requires supported eversion of the buttocks and steady gentle pressure of the well-lubricated instrument upon the anus in the direction of the umbilicus, until the sphincters are felt to yield; or the patient may be required to bear down to take the speculum. As the instrument enters the inflatable, movable rectum it should be pointed toward the promontory of the sacrum and subsequently into the sacral hollow. The with-

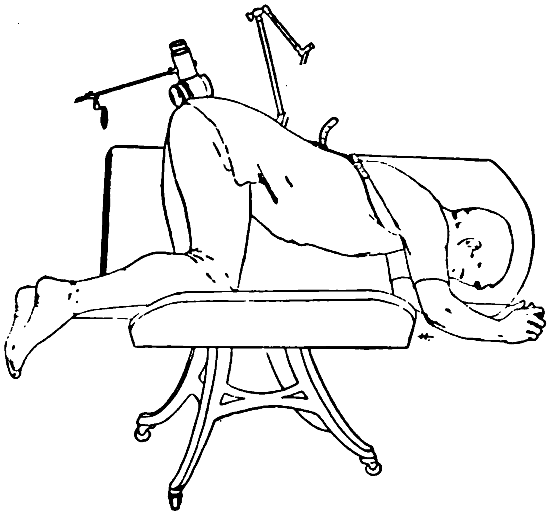


FIG. 409.—POSITION NO. 4. The extreme oblique lateral position.

drawal of the obturator is followed by atmospheric inflation of the rectum.

(3) The operator should observe the degree of rectal distention, the situation and number of the rectal valves, their propinquity to one another when passive, and the relation of one valve to another at the time of the patient's bearing down. Under pressure of the proctoscope, if possible, or the hook (Fig. 410), if necessary, each valve should be effaced or displaced, and in regular order each of the rectal chambers should be carefully inspected. A proctoscopic mirror may be necessary for viewing the supravulvar surfaces (Fig. 411).

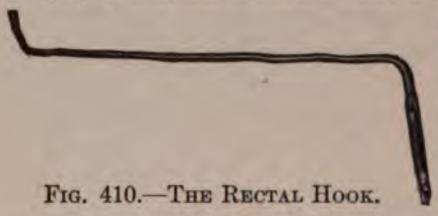


FIG. 410.—THE RECTAL HOOK.

The examination being finished, the proctoscope should be withdrawn, the illumination apparatus fixed in the first position, the leg footboard lifted to its place, the lever extended, the crank turned, and the chair carried back to the horizontal and upright positions; the patient being thus returned to her feet by the execution in the reverse order of the several steps described.

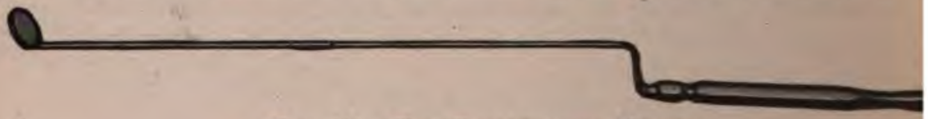


FIG. 411.—THE PROCTOSCOPIC MIRROR

This method of inspection does not subject the patient to struggle or strain, and need excite no embarrassment.

Observation by this method teaches that, in nearly all cases of disease at the anus, there is congestion of the rectal mucous membrane, and that not unusually a diffused proctitis attends anal disease.

Those cases in which there is no apparent lesion at the anus and which are in a perfunctory way sometimes declared to be catarrh of the rectum will at once have their real cause, such as a high-up rectal polypus or a congenital or organic stricture or ulceration, positively diagnosticated, and will be made accessible for intelligent treatment.

New growths or ulcerations may be seen, and, by means of a long-handled curette, scrapings made, in order that the microscopist may determine their exact character.

Vesicorectal, vaginorectal, and deeper rectal fistulæ are often apparent at a glance, but in any case may be discovered by the use of the proctoscopic mirror.

The existence of stricture of the rectum need no longer be regarded as only doubtful, and this method proves positively, even to the casual observer, how fallacious is the rectal sound as usually employed in the diagnosis of stricture. It has been repeatedly shown how easy it is for an entering or returning bulb-sound to be caught and held by the rectal valves, and to elicit those signs which are generally considered diagnostic of organic stricture of the rectum.

The rectal valve constitutes the chief topographical feature of the abdominal rectum. Its histologic character indicates it as the typical anatomic valve. The attached border of each valve spans a little more than half the circumference of the rectum, and its free border projects half way across the diameter of the inflated rectum. Thus, what has heretofore been regarded as a cavernous ampulla is seen to be divided into several chambers. There are as many chambers in the rectum as there are rectal valves. The number of rectal valves is variable. Some subjects have but two, others have four, but 90 per cent. of persons possess three. The uppermost valve is invariably situated at the juncture of the rectum and the sigmoid flexure, and is usually on the left wall; the next is on the right, and the lowermost on the left wall. The positions of the lower two valves are sometimes anterior and posterior, respectively. It must be readily seen that the newer methods of rectal inflation for rectal inspection will determine newer notions of the topography of this part, and will justify consideration of the lowermost chamber as the first rectal chamber; of the cavernous area beyond the first valve and below the second as the second chamber; and of the upper chamber as the third or perhaps the fourth, according to the number of valves. The ancient arbitrary division of the rectum by the anatomists into upper first, middle second, and lower third parts should be abandoned.

If this method of ocular examination is practiced there need be no longer any excuse for calling an undiagnosticated disease of the rectum an "obscure disease"; and, whatever the disease present, this method makes it susceptible of demonstration to the patient's physician or attendant friend. There is no necessity whatsoever that the diagnosis of rectal disease be taken on faith.

203. PROCEDURE FOR COMBINED DIGITAL EXAMINATION OF THE RECTUM AND VAGINA

It is sometimes very important, especially in surgical conditions involving the rectovaginal septum, that there be a coincident digital exploration of both canals. For this purpose one index finger may be introduced into the rectum and the other in the vagina. I generally accomplish the manipulation with one hand, introducing the index finger into the rectum and the thumb into the vagina, as shown in Fig. 412.

GENERAL PROCEDURE IN
OPERATIONS

PREPARATION OF THE PA

The effort should be made in all capital sur
the patient in the best possible condition, (a)
pressing influence of hemorrhage; (b) to resis
infection, and (d) to maintain functional acti

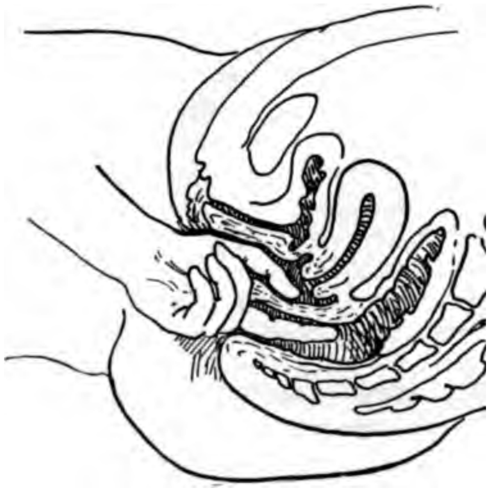


FIG. 412.—(203) PROCEDURE FOR CONJOINED RECT

PREPARATION IN CASES OF EMERGENCY

In cases of emergency, such, for instance, as ruptured ectopic pregnancy, or placenta prævia, or ruptured uterus, or ruptured pus tube, or fulminating appendicitis, there is but little time for preparation.

In cases of hemorrhage, necessitating precipitate intervention, the circulation of the patient should be reimbursed as speedily as possible. This should be done by the transfusion of blood or by the intravenous injection of from 1 to 2 liters of normal salt solution, or, still better, if available and properly prepared, a strong alkaline solution consisting of sodium bicarbonate and sodium chlorid in water. These are the ingredients of what has become popularized as "Fischer's solution," devised by Prof. Martin Fischer, of the University of Cincinnati. The only objection to the Fischer solution is that it cannot be safely extemporized, and should not be used unless carefully prepared. The object in using a strong alkaline solution is not only to restore the volume of the circulatory medium, but to overcome the marked acidosis that is almost instantly developed as an early feature of shock in most hemorrhage cases. The intravenous injection, whether of blood by transfusion or of saline or alkaline solution by direct infusion, should, if practicable, be undertaken coincidentally with the commencement of operation for the arrest of hemorrhage.

204. PROCEDURE FOR THE TRANSFUSION OF BLOOD

(1) The middle brachial vein of the donor should be compressed until it becomes prominent.

(2) The middle brachial vein of the recipient should be compressed until it becomes prominent.

(3) Both veins should be exposed by direction and ligated.

(4) The vein of the donor should have a second ligature placed loosely under it, 1 cm. toward the hand from the first ligature.

(5) The vein of the recipient should have a second ligature placed loosely under it, 1 cm. toward the elbow from the first ligature.

(6) The end of the transfusion needle pointed toward the hand should be inserted into the distended vein of the donor and the loose ligature tied with a single bow knot, thus embracing both the vein and the point of the needle.

(7) As soon as the connecting tube has become filled with blood it should be compressed with a hemostatic forceps or the thumb and finger of an assistant.

(8) The other transfusion needle, pointing toward the elbow, should then be inserted into the collapsed vein of the recipient, and the loose

ligature tied with a single bow knot, thus embracing both the vein and the point of the needle.

(9) The compression should be removed from the connecting tube and the blood be permitted to flow from the donor to the recipient, until the donor begins to weaken from the loss of blood. This time can be deferred and more blood for transfusion be made available by having the donor drink large quantities of water just preceding and during the operation.

(10) When sufficient blood has been transfused the needle should be removed from the recipient first and from the donor instantly afterward, and both ligatures tightened around the veins. If catgut ligatures have been used they will be dissolved and the lumen of the veins restored after the lapse of a few days.

(11) The cutaneous incisions should be closed by a few interrupted sutures and the wound dressed.

If a donor is not available intravenous infusion of normal salt solution or of the strong alkaline (Fischer's) solution should be practiced.

205. PROCEDURE FOR THE INTRAVENOUS INFUSION OF (A) NORMAL SALT SOLUTION OR (B) THE SALINE (FISCHER'S) SOLUTION

(1) Place the solution at a temperature of 100° F. in a sterilized fountain syringe, equipped with either a special needle for the purpose or with a small blunt-pointed trocar attached to the end of the tube.

(2) (a) Compress the middle brachial vein of the patient until it is prominent, and (b) expose it by dissection for a distance of about 3 cm.

(3) Ligate the exposed vein lightly with catgut at the distal extremity of the wound.

(4) Place another ligature loosely under the vein 1 cm. toward the elbow from the first ligature.

(5) Open the vein with a slight linear incision.

(6) (a) Let the water run for a few seconds through the needle; (b) insert the needle in the vein; (c) tighten the loose ligature around the needle and the vein, tying it temporarily with a single bow knot.

(7) After 1 to 2 liters of solution have flowed into the vein the needle is withdrawn, the ligature permanently tied, and the cutaneous incision closed with a suture or two and dressed.

In cases of extreme emergency the operations of transfusion and of infusion should be done at once, while the surgeon is controlling the bleeding vessel. This requires the presence of skilled assistants. When they are not available the surgeon must have recourse to the less desirable but still effective method of fortifying the circulation by hypodermoclysis.

206. PROCEDURE FOR HYPODERMOCLYSIS

(1) A fountain syringe or other similar apparatus is filled with 2 liters of normal salt solution at a temperature of from 100° to 105° F., the effluent tube being supplied with an aspirator needle.

(2) Let the water run through the needle for a minute or so.

(3) A mammary gland is gently seized, lifted as far away from the chest wall as possible, and the needle thrust well under the gland from the side, the point of puncture having been previously carefully cleansed.

(4) The solution is permitted to flow under the breast, which should be gently massaged as the distention from the accumulating fluid becomes pronounced.

(5) After from a half to a whole liter has been permitted to flow in, the other breast may be similarly treated.

(6) As the needle is withdrawn a piece of adhesive plaster should be placed over the point of puncture, to prevent the outflow of the fluid.

This procedure, while less prompt in its results, has the advantage of being quickly done without the necessary presence of a skilled assistant.

Strychnia and adrenalin or other heart stimulants should not be administered before the bleeding vessel has been brought under control. They should, however, be given just as soon as the hemorrhage has been brought under control (see Post-operative Treatment).

PREPARATION OF THE PATIENT IN ELECTIVE CASES

In the absence of an emergency, such as hemorrhage, acute sepsis, or strangulation, time should be taken to prepare the patient's system for the operation. This should be done by giving particular attention to the state of the secretions. Most patients, particularly those of the more chronic class, are constipated, and their systems are, as a consequence, laden with toxins from the hyperabsorption constantly going on from the alimentary canal. The condition is all the more serious because of the defective peristalsis, which is liable to be still further weakened, if not entirely arrested, by the influence that the operation exerts upon the sympathetic nervous system. It is highly important for these two reasons, if for no other, that the bowels should be not only unloaded, but brought to an approximately normal standard of activity. This is best done by giving the patient a small dose (one-sixtieth of a grain) of strychnin with salol (three grains) three times daily, associated with a persistent course of salines. For the latter purpose the magnesium sulphate, the sodium sulphate, or the sodium phosphate may be employed, either in the form of some of the natural mineral waters or by dissolving some of the salt in plain water. More important, perhaps, than the selection of the remedy is the manner of its administration. The best results are obtained by giving dram doses, beginning not before but after a meal. If the chosen remedy is continued in this way during twenty-four hours, and no laxative effect is realized, it may be well to unload the bowels of their now softened contents by administering one full dose of the medicament, given this time on an empty stomach. The saline should not be discontinued so soon as the bowels have been evacuated, although a little time should be given for the previously secured laxative effect to subside. The saline should then be resumed in half doses, given an hour or two after each meal. In this way it becomes mixed with the ingesta, and, by stimulating both secretion and peristalsis, prevents a return of the constipation. A constipation of long standing may thus frequently be broken up in the course of a week, often with permanent results.

The condition of the kidneys is very important, as is the correction by judicious medication of any error that may be found in their secretion. The condition of the skin should equally be the object of careful investigation and treatment. This latter precaution is of greater importance than is generally recognized. It is only necessary to mention that failure of the urinary function, as the result of the action of the anesthetic on the kidneys, is one of the most frequent fatal complications following visceral operations; and that in the presence of such a complication the chief hope of the patient lies in the compensatory activity of the sweat glands. It is highly important, therefore, that they be put in a state of normal activity before the operation. Baths, if necessary, with dry heat or steam, and followed by friction, continued during several days, generally constitute all the treatment that is required.

The digestive function should be brought to as high a state of efficiency as possible. It is highly important to urge a word of caution against the prevalent habit of purging patients excessively before operations. It is not unusual for patients to be forced to have a dozen or more dejections during the twelve or twenty-four hours before undergoing the ordeal of an abdominal section, and during this time they are kept upon a reduced diet, and often during the final twelve or fifteen hours are given nothing at all to eat. It should be borne in mind that such hypercatharsis (a) weakens the patient, (b) still further weakens peristalsis, (c) aggravates post-operative thirst, and (d), by draining the circulation, stimulates all of the absorbent functions, and thus lays the foundation for systemic sepsis in the presence of unavoidable local infection.

Hypercatharsis with fasting tends of itself to induce acidosis, the very condition that is the greatest menace to the patient following operation. The practice is wholly wrong and should be abandoned.

INSTRUMENTS FOR GENERAL ABDOMINAL OPERATIONS

There are certain instruments that are essential and others that it is desirable to have at hand. It is well, furthermore, to have a list of instruments for particular cases. Robb has arranged such a list for abdominal operations as follows:

INSTRUMENTS FOR AN ABDOMINAL SECTION

Aspirator.	
Cautery (Paquelin).	
Forceps:	
Long dressing	1
Long hemostatic	6
Medium hemostatic	3
Small hemostatic	3
Bullet	1
Rat-tooth	2
Needles, curved:	
Very large (No. 1)	1
Large (No. 4)	2
Intermediate (No. 3)	2
Small (No. 2)	2
Intestinal (No. 1)	2
Transfixion, right curved	1
Trocars, large and small.	
Needles, straight	2
Needle holder	1
Retractors:	
Large	2 pairs
Next size smaller	2 "
Scalpels	2
Scissors:	
Long	1 pair
Short	1 "
Sound, uterine	1
Speculum, Sims' small	1
Sponge holders	4
Tenacula:	
Straight	1
Curved	1
Two Nélaton forceps.	
Rubber tubing.	

Every operator finds certain instruments of special utility to himself. This is largely the result of both personal aptitude and habit. I have found the instruments on the following pages to be very helpful:

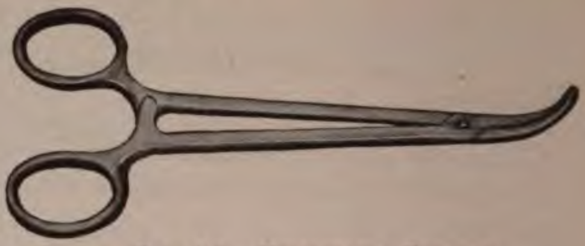


FIG. 413.—HEMOSTATIC FORCEPS.

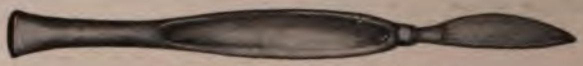


FIG. 414.—ORDINARY SCALPEL.

A scalpel, to be entirely satisfactory, should have a thin blade with a keen edge. I have so generally found the thickness of the blade an objection to the ordinary commercial instrument that it has occurred to me that a very thin, detachable blade, made of excellent material and mounted in handles susceptible of safe sterilization would be a desideratum. The Messrs. Wocher of Cincinnati have carried out this suggestion in such admirable fashion (Fig. 414a) that I now use no other knife.

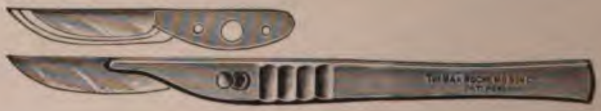


FIG. 414A.

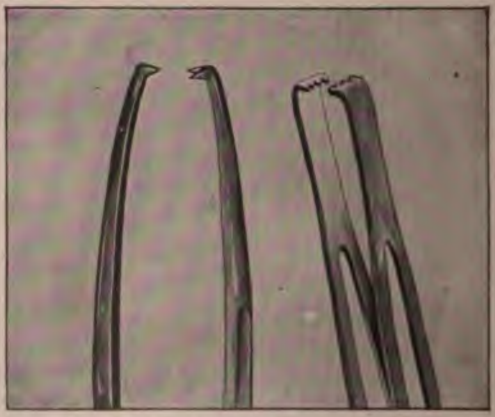


FIG. 415.—DISSECTING FORCEPS.

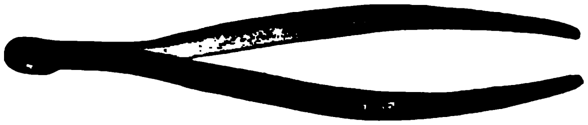


FIG. 416.—DISSECTING FORCEPS.

FIG. 417.—NEEDLE HOLDERS.

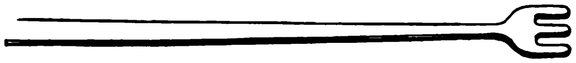


FIG. 418.—PACKER.

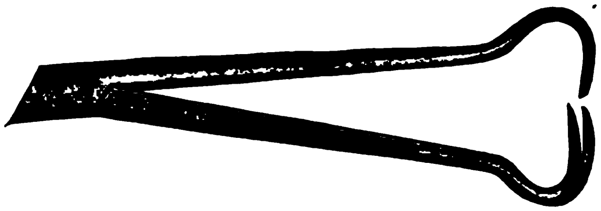


FIG. 419.—CULLEN'S TENACULUM.

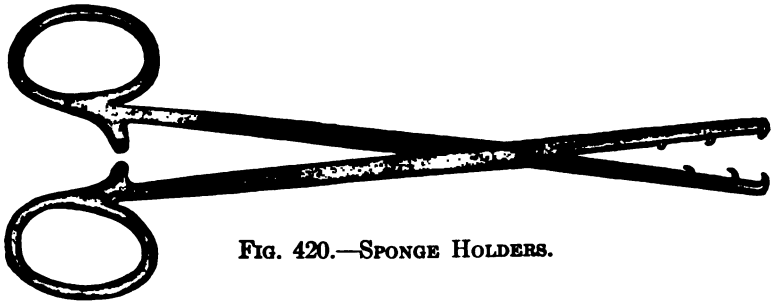


FIG. 420.—SPONGE HOLDERS.

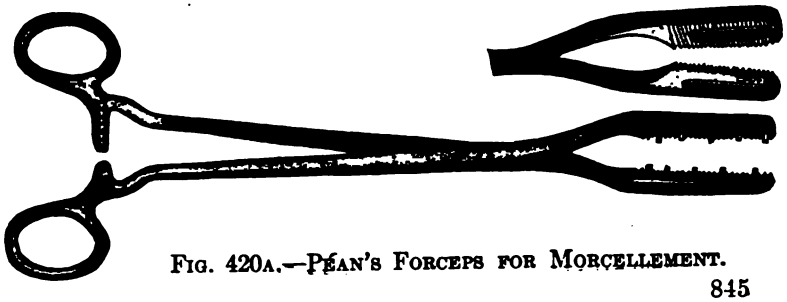


FIG. 420A.—PÉAN'S FORCEPS FOR MORCELLEMENT.

F . 425.—Tenacula.

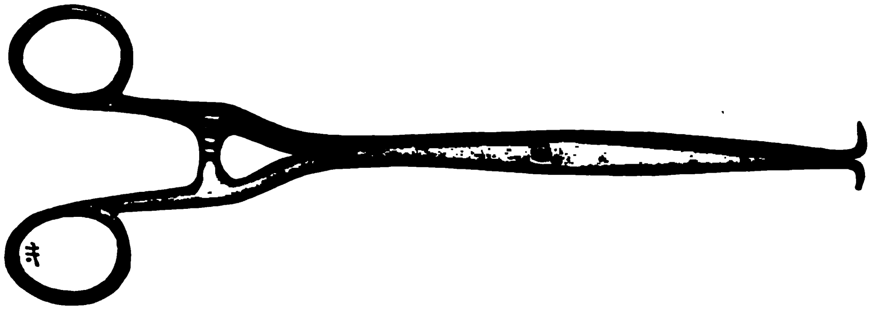


Fig. 426.—Newman Reverse-acting, Self-locking Volsella.

THE SURGICAL PAVILION

All surgical operations should be done when practicable in a well-equipped pavilion consisting of (a) a sterilizing room, (b) a room for anesthesia, and (c) an operating room.

The sterilizing room should be equipped with every facility for the sterilization by heat of all garments, sheets, dressings, instruments, and appliances that may come in contact with the field of operation. This room should be devoted exclusively to the purpose indicated and should be in charge of a person who has a scientific understanding of the principles and practice of asepsis.

The anesthetizing chamber should be adjacent to the operating room and should be equipped with necessary apparatus for the administration of all anesthetics except gas and oxygen, which must be given after the patient is on the table.

The operating room should be constructed with walls and floors that can be asepticized and that are not porous. It should have natural light, if possible, from the north and from the ceiling, and artificial light provided by abundance of incandescent electric lamps of high candle power, so located as to illuminate the field of operation. Numerous stationary wash stands should be located in, not outside, the room, and these should be provided with hot and cold filtered water and be operated with the feet and knees. There should be a series of chemical solutions conveniently arranged for hand sterilization. Glass-topped tables should be at hand for instruments. The operating table should be a mechanical device by which the patient may be conveniently shifted into any needed position as nearly as possible without being touched by the hands of the attendants. These comprise essential equipment for doing surgery under the most favorable circumstances. They, when associated with intelligent and rigid discipline, comprise the conditions under which the most favorable results of modern surgery are realized. It is, therefore, the duty of surgeons, whenever possible, to give their patients the benefit of these features of modern advancement.

ANESTHESIA AND ANESTHETICS

ETHER ANESTHESIA

Ether is to-day the anesthetic of choice by American operators. There is no occasion in this connection to discuss either its chemistry or its physiological action. It is best administered by (a) the drop method and (b) the open method.

207. PROCEDURE FOR THE ADMINISTRATION OF ETHER BY THE DROP METHOD

(1) The patient, preferably upon the back, may occupy any necessary position that will permit the application of the mask to the face.

(2) A mask consisting of a wire canopy, over which several thicknesses of sterile gauze have been stretched, is placed over the nose and mouth.

(3) The ether is permitted to fall upon the mask drop by drop with sufficient rapidity to keep the gauze moistened.

(4) If the temperature of the room is very high, or if the mask does not fit the face, the evaporation of the ether may be lessened by a towel, folded lengthwise, wrapped around the face and the base of the mask.

(5) No more ether should be given than is necessary to maintain the unconsciousness and relaxation of the patient.

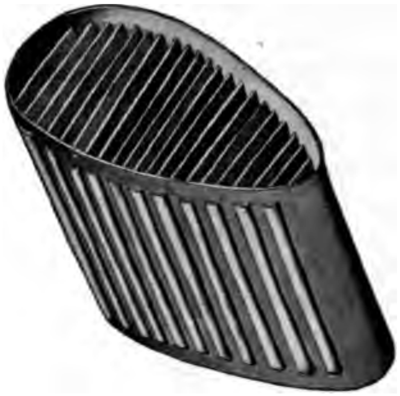
208. PROCEDURE FOR THE ADMINISTRATION OF ETHER BY THE OPEN METHOD

(1) The patient is placed in the dorsal position with her head low and all clothing loosened about her neck and chest.

(2) Her nose and mouth are covered with one end of an Allis inhaler. This is a cylindrical or ovoid cover around a grated case, from the gratings of which layers of cotton cloth pass from side to side (Fig. 427). The air passes freely between the layers of cloth, which, being wet with ether, load the inspired air with anesthetic vapor. If made

of metal, so that it can be boiled after each use, and kept rigidly clean, this is the best inhaler on the market, because it gives plenty of ether and it permits a view of the face of the patient.

(3) The ether is poured upon the layers of cotton cloth in quantity sufficient to keep it saturated without dripping.



ᵎIG. 427.—THE ALLIS ETHER INHALER, WHICH IS A CYLINDRICAL OR OVOID COVER AROUND A GRATED CASE, FROM THE GRATINGS OF WHICH LAYERS OF CLOTH PASS FROM SIDE TO SIDE. (Hare.)

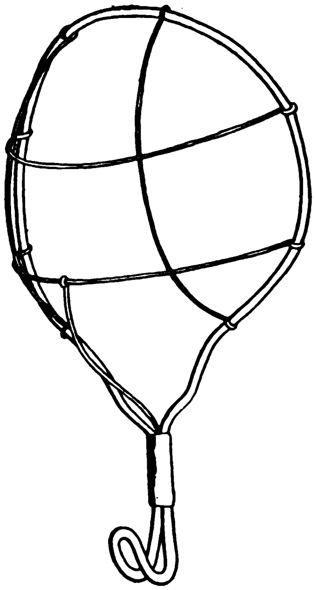


FIG. 428.—ESMARCH'S CHLOROFORM INHALER.

CHLOROFORM ANESTHESIA

Chloroform is probably the anesthetic of choice in Great Britain. The Civil War of the United States was fought with chloroform as practically the only anesthetic, and with practically no deaths due to anesthesia. It has had a long and useful career, and is yet the anesthetic of choice by many operators. The fact, however, that when death does occur from its administration the circumstances are generally tragic has led to the more general employment of ether, the deaths from which, when they do occur, happen but rarely upon the table.

209. ESMARCH PROCEDURE FOR THE ADMINISTRATION OF CHLOROFORM

(1) The patient upon her back has her face anointed to prevent the irritating effect of the chloroform.

(2) An Esmarch mask, consisting of a wire canopy covered with several layers of gauze (Fig. 428), is placed over the nose and mouth.

(3) The chloroform is permitted to fall, drop by drop, upon the gauze, the entire area of which is at no time permitted to become saturated.

(4) If there is any tendency to asphyxia the mask is to be removed for a few seconds.

COCAIN ANESTHESIA

Cocain, or its congerers, eucain and novocain, may be employed in gynecologic practice for both (a) local anesthesia and (b) central (spinal) anesthesia.

210. PROCEDURE FOR LOCAL ANESTHESIA BY COCAIN

(1) A 1 per cent. solution is injected hypodermically into the area of proposed operation.

(2) A similar solution is injected at several points around the same area.

(3) After the lapse of from five to ten minutes the analgesia will be complete in the area thus treated.

The objection to cocain as a local anesthetic in gynecologic practice is that so much is required that dangerous constitutional effects are sometimes experienced.

In 1885 J. Leonard Corning used spinal anesthesia by injection of the arachnoid space with a solution of cocain. It was not, however, until 1901 that the procedure was extensively popularized by Tuffier.

211. TUFFIER PROCEDURE FOR SPINAL ANESTHESIA BY COCAIN

(1) Draw an imaginary line from the crest of one ilium to the other.

(2) The forefinger of the left hand is placed on the spine of the vertebra just above the line indicated.

(3) The detached needle of a hypodermic syringe is now inserted to the right and a little above the tip of the left forefinger, being pushed between the vertebræ into the spinal canal (Fig. 429). The escape of arachnoid fluid will indicate that the needle has entered the canal.

(4) The loaded barrel of the syringe is now attached to the needle through which the solution of cocain is discharged slowly and without force.

From 1.5 to 2 cubic centimeters of the fluid are used, the dose depending somewhat upon the size of the patient. Anesthesia from the diaphragm to the toes will develop in from ten to twelve minutes; and the insensibility thus induced will last from one to three hours. The cardiac disturbance induced by this form of anesthesia is less than that from either ether or chloroform.

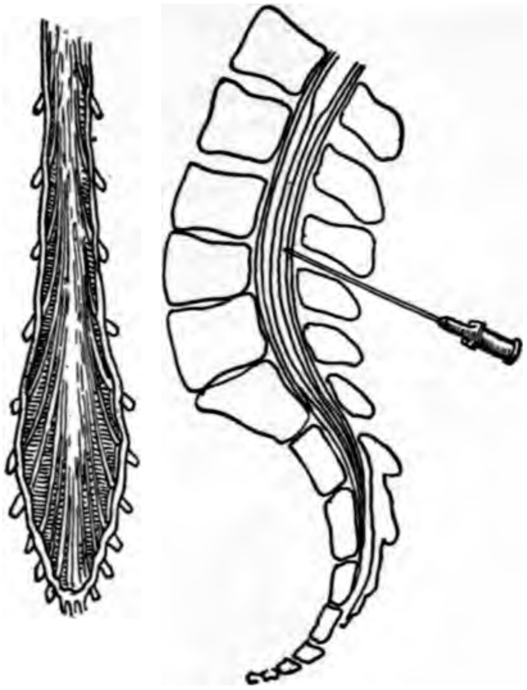


FIG. 429.—POINT OF PUNCTURE FOR SPINAL ANESTHESIA.

Tuffier uses a 2 per cent. solution of cocain, which he sterilizes by heat, the sterilization being repeated on two consecutive days.

NITROUS-OXID-OXYGEN ANESTHESIA

Nitrous oxid (N_2O) is a chemical combination of nitrogen and oxygen in contradistinction to air, which is simply a mixture of these two gases. It is obtained by heating ammonium nitrate to 250° C. and purifying the product. It has no odor, but has a faintly sweet taste. This gas in combination with oxygen as an anesthetic was first used by Andrews, of Chicago, in 1868, but it is only in the past decade that the use of this combination has become more or less general for major surgery. This is probably the safest general anesthetic known, and has a death rate variously estimated at from 1 to 20,000 to 1 to 50,000, ether being second with an estimated death rate of 1 to 5,000 to 1 to 10,000.

Nitrous oxid is a true anesthetic, i. e., it does not depend upon

(5) As soon as hypnosis is beginning to be manifested, or as soon as there is a suggestion of cyanosis, the oxygen is turned on.

(6) Anesthesia is maintained without cyanosis and without respiratory or cardiac embarrassment by the constant adjustment and readjustment of the volume of nitrous oxid and oxygen respectively.

(8) If muscular tonus cannot be overcome by the gases alone a little ether vapor may be turned on and administered through the same tube. When relaxation has thus been secured it can generally be maintained by the gases alone.

(9) When the operation is completed turn off the nitrous oxid and turn on the pure oxygen for a few minutes.

The patient ordinarily regains consciousness in from two to three minutes.

The morphin and atropin are given not only on account of their narcotic action, which permits of the use of less nitrous oxid, and, therefore, more oxygen, but also because they render the respiratory center less susceptible to slight increases in the arterial CO_2 content. This preliminary injection also prevents pain immediately after the completion of the operation, as without it the patient usually recovers consciousness as soon as the anesthetic is withdrawn. The patient should be anesthetized on the operating table.

During the administration itself the anesthetist should be conscious of every single breath, its rate, its depth, and its rhythm. He should also keep his finger constantly on the temporal pulse and note the slightest change in color and pupillary reaction. The patient should be brought gradually under the influence of the anesthetic, and the constant aim should be to give as much oxygen as is possible, consistent with an even surgical anesthesia. A slight grade of cyanosis is not objectionable. The apparatus to be used should have available for instant use an uncontaminated supply of oxygen; should permit of rebreathing; and should have an attachment for the administration of ether, should the necessity arise.

Gas-oxygen is administered with greatest convenience in a hospital, but can be given any place to which the cumbersome apparatus can be moved.

Contrary to what obtains in general surgery, there are no contraindications to the use of nitrous-oxid-oxygen in gynecology. Women are much more easily anesthetized than men. Lack of muscular relaxation, the greatest drawback to this anesthetic, practically never occurs in those who have been pregnant, and is of no significance in perineal work. Any associated condition which interferes with respiration will be a source of annoyance, as the oxygen intake will average only about 10 per cent. "No anesthetic is safe when the heart is badly

213. PROCEDURE FOR THE INDUCTION OF ANESTHESIA BY THE INTRAVENOUS INJECTION OF HEDONAL (PIRRUNG)

(1) Give a hypodermic injection of one-fourth grain of morphia sulphate and 1/150 grain of atropia sulphate.

(2) Sterilize the left arm at the elbow by painting with tincture of iodin.

(3) Inject into the skin over the vein selected from one-half to one dram of a two per cent. solution of cocain or eucain.

(4) Make an incision through this skin to the vein and pass a double strand of catgut under it.

(5) With this catgut tie the distal end of the vein.

(6) Make a longitudinal incision into the vein above this ligature.

(7) Into this opening insert a cannula (solution flowing) and then tie.

(8) To render the position of the tube more secure, and to prevent its slipping away from the vein, it may be bound to the arm with adhesive plaster, or a splint may be used.

(9) Allow the solution to flow rapidly until patient shows general signs of anesthesia. The usual method will require 300 to 500 c.c. of 0.75 solution of hedonal in normal saline.

(10) Cut down the flow to about 60 to 100 minims a minute, using only enough to maintain the anesthesia already produced.

Very little of the solution is required after the abdomen is opened.

The apparatus needed consists of:

(1) A closed metal or glass reservoir jacketed to maintain the heat.

(2) A tube and bubble trap.

(3) A cannula.

No pumping apparatus is required, as gravity gives quite enough force to the flowing solution.

It is needless to add that the entire apparatus must be carefully sterilized, and that rigid asepsis be carried out in injecting the solution.

This method of anesthesia has been successfully employed by Monyhan and others in Great Britain.

Ether, chloroform, and isoprol have also been successfully given intravenously, but are considered less safe and otherwise less desirable than hedonal.

THE ABDOMINAL INCISION

The incision for invasion of the abdominal cavity may be made at any point and in any direction in the abdominal wall. The incision, its location, and direction should be selected specifically with reference to the object in view.

Kocher definitely outlined the proper location of various incisions for various purposes as follows:

The Vertical Median Incisions.—The incision *E* (Fig. 431) may be called the low vertical median incision, while that designated *B* (Fig. 431) is the high vertical median incision. The latter should be employed in operations upon the stomach, and in other operations in which it is desirable to reach the organs lying in the upper part of either of the upper quadrants of the abdominal cavity. A vertical incision (*C*, Fig. 431) is sometimes made in the left upper quadrant for operations upon the spleen. The incision in the median abdominal line is the best in all cases in which it is necessary to deal with both sides of the pelvis, or in those cases in which it may be uncertain as to which side of the pelvis may be the ultimate seat of operation. The *median line* is, as a rule, the safer *locus* for a general exploratory incision. It should always be employed in the presence of surgical conditions lying immediately beneath it.

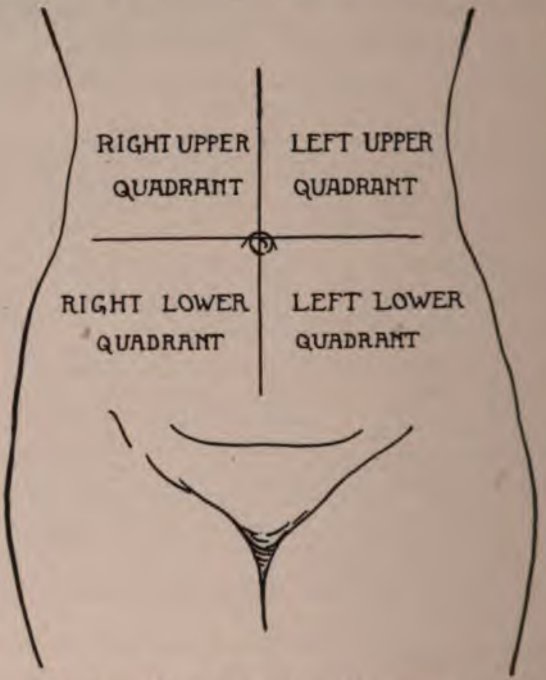


FIG. 430.—ABDOMINAL QUADRANTS.

The Transverse Umbilical Incision.—This incision is made transversely at the *umbilicus*, and may be employed in dealing with practically all conditions developing in that locality. It is the ideal incision in the management of umbilical hernia. As a rule, a post-operative ventral hernia occurring in this locality, or, for that matter, at any other point above or below the umbilicus, may be safely and desirably approached through a transverse incision, while the hernia itself should be approximated in a transverse rather than a longitudinal line. This line of incision is of especial importance in fat people. These patients, lying upon their backs, exercise all of the gravity which is derived from the heavy and mobile abdominal walls in a spontaneous tendency to retract from the longitudinal median line, while their equally natural tendency is to hold a transverse approximation in continued apposition.

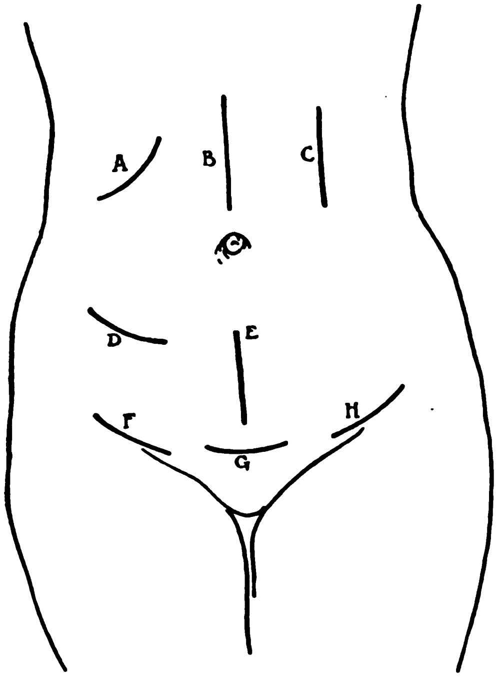


FIG. 431.—ANTERIOR ABDOMINAL INCISIONS.

A, Right Lateral Incision for Gall Bladder Pylorus. Colon at Splenic Flexure.
B, Upper Median Vertical Incision for Stomach and Transverse Colon.
C, Left Lateral Incision for the Spleen and Cardiac End of Stomach.
D, Right Oblique Incision for Cecum and Vermiform Appendix.
E, Lower Median Vertical Incision for Intrapelvic Organs.
F, Right Lower Oblique Incision for Poupart's Extraperitoneal Structure.
G, Lower Median Transverse for Bladder and Lower Abdominal Zone.
H, Left Lower Oblique Incision for Poupart's Ligament and Sigmoid.

The Transverse Suprapubic Incision (*G*, Fig. 431).—This incision should be made transversely to the median line, immediately above the pubes, in all operations in which it is desirable to approach the bladder from the outside. This occurs with frequency in gynecological practice.

The Oblique Ventral Incision (*F*, Fig. 431).—The oblique ventral incision should be employed in dealing with the common iliac artery, as sometimes becomes necessary in gynecological practice; it may be used on the right side in dealing with the suppuration about the head point of view. The retraction of the skin that frequently ensues, notwithstanding the most careful approximation of the cutaneous margins, frequently results in post-operative widening of the cicatricial area. Frequently under this influence the scar tissue undergoes what is spoken of as a keloid change. When, therefore, the cutaneous incision can be made transversely, the underlying layers being divided in any direction to suit the operator, but preferably in the direction of their respective *striæ,* the result is always more satisfactory. There is nothing more striking than the difference between a scar made transversely to and one coincidentally with the cutaneous folds, the latter becoming practically imperceptible after a very few weeks, while the former shows a constant tendency to increase in size and to diminish in retentive power.

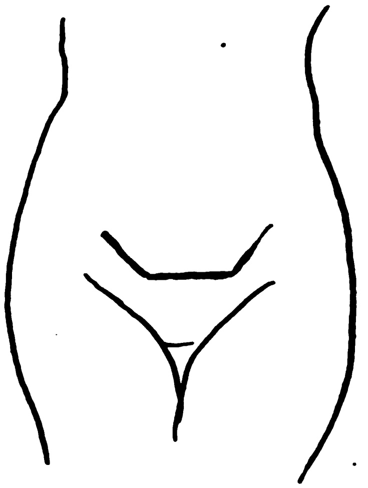


Fig. 432.—Transverse Infraabdominal Incision of Pfannenstiehl.

Transverse Infraabdominal Incision (Pfannenstiehl).—This incision is gaining some favor in the United States. Farr (R. E.) has written favorably about it and reports advantages in conditions in the pelvis and lower zone of the abdomen. He makes the incision along the lines indicated on Fig. 432, dividing the recti muscles a little above the symphysis pubis. He insists upon its advantage in closure and subsequent cicatrization the scar being almost evanescent.

214. PROCEDURE FOR MAKING THE MEDIAN ABDOMINAL INCISION

(1) Make the preliminary incision at one stroke, going through only the integument and the superficial fat.

(2) Make the incision through the superficial fascia deliberately.

(3) Control all actively bleeding points. The blood should be speedily wiped away by means of a bit of dry sterilized gauze, so that the structures may be kept clearly in view. The gauze thus used should be immediately thrown away. Much time is often lost in needless attention to unimportant bleeding. As a rule, that bleeding which is merely capillary or venous may be left to itself, while a pulsating jet should be at once controlled by means of a hemostatic forceps. This should not be hastily applied, and should always be adjusted with

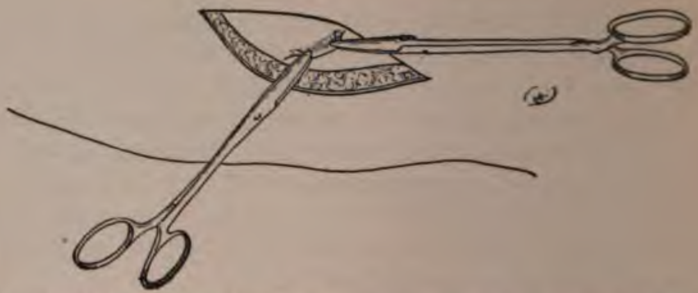


Fig. 433.—(214) Procedure for Making Abdominal Incision. (a) Lifting the peritoneum before incising at the opening the abdominal cavity.

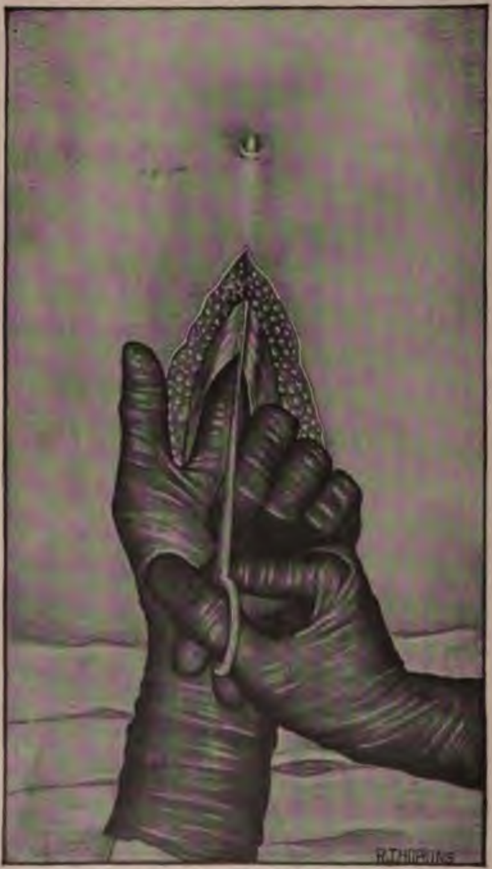


Fig. 434.—(214) Procedure for Making Abdominal Incision. (b) The peritoneum carefully incised coincidently and coextensively with the upper part of the incision.

and precision. Many careless operators and assistants simply take a large bite of tissue somewhere in the neighborhood of the bleeding point, with the object, of course, of controlling the hemorrhage. The pressure thus imposed upon the tissue, particularly the adipose tissue, which is found in such abundance in the abdominal wall, is liable to induce necrosis, and thus interfere with primary union. A few seconds of time should be taken to isolate more or less definitely the bleeding point, which should then be picked up accurately by the point of the hemostatic forceps.

(4) When the muscular layer is exposed split the muscle coincidentally with its fibers by finger dissection.

(5) As soon as the deep fascia or the subperitoneal fat is reached the presenting structure should be picked

up by two hemostatic forceps (Fig. 433), which should be reapplied as often as may be necessary to hold the peritoneum away from the underlying viscera.

(6) Nick the peritoneum. The moment this is done the air rushes in and the intestines fall away from the abdominal wall. Failure to observe this precaution sometimes results in the totally unnecessary wounding of the intestines or other structures within the abdominal cavity.

(7) Using one index finger on the inside as a guide, the peritoneum should be carefully incised by means of either scissors or a knife, coincidentally and coextensively with the upper part of the incision (Fig. 434).

(8) As soon as the peritoneum is opened care should be taken permanently to arrest all hemorrhage in the abdominal incision and to remove the forceps.

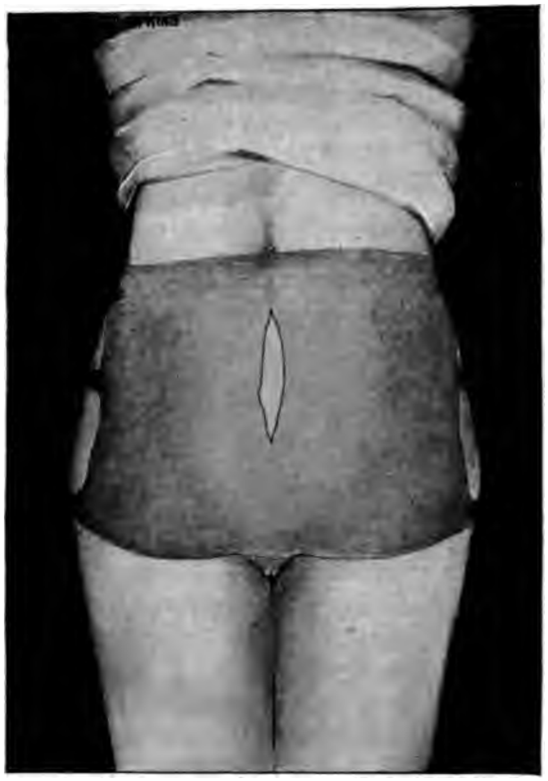


FIG. 435.—(214) PROCEDURE FOR MAKING ABDOMINAL INCISION. (c) Fenton B. Turck method of covering the abdominal wall with a sheet of rubber dam.

(9) In the course of an operation it may be, and frequently is, necessary to enlarge the incision; in doing so great care should be exercised to make the additional opening directly in line with the previous one, and to observe the same precautions in dealing with the incidental hemorrhage. It is better to employ a knife for this purpose rather than the scissors, which are generally so convenient, so expedient, and so generally utilized by the hurried surgeon. The scissors are objectionable because in the act of cutting they produce a certain amount of cell destruction, which is obviated by the keener edge of the knife.

(2) Stitch the peritoneum shut with a continuous catgut suture (Fig. 437).

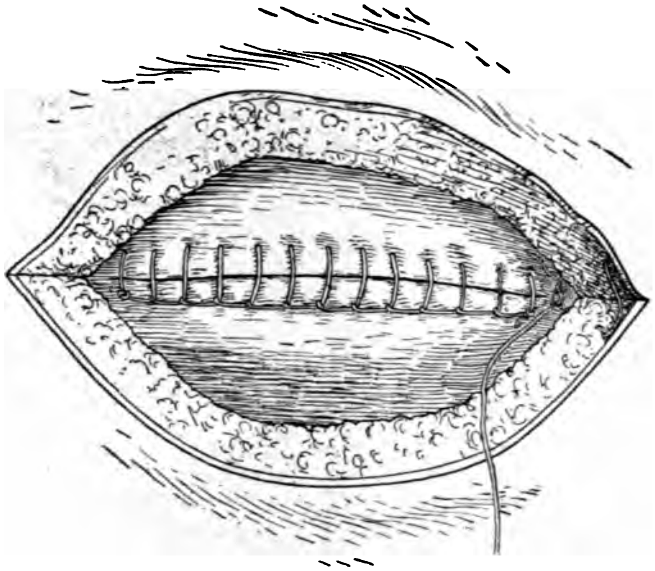


Fig. 438.—(215) Procedure for Closure of the Abdominal Incision by Laminated Suture. (b) Method of stitching the fascia with the continuous hemostatic suture of slowly absorbing material.

(3) Anchor the muscular margins together by two or three interrupted sutures of the same material.

(4) Close the fascial layer with continuous hemostatic suture of the same material (Fig. 438). This is the most accurate approximation of this important layer (Fig. 439).

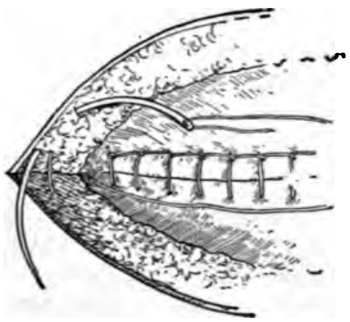


Fig. 439.—(215) Procedure for Closure of the Abdominal Incision by Laminated Suture. (c) Method of beginning the subcuticular suture.

(5) This suture may be fortified with one or two interrupted sutures of silkworm gut passed through the skin, fat, and fascia of one side and out through the fascia, fat, and skin of the other side. These sutures serve to approximate the fat layer.

(6) The skin edges may be approximated by (a) intercutaneous suture (Fig. 440), or by (b) superficial continuous suture, or (c) the Michelin clips, after which the silkworm gut sutures are tied.

in the skin with a needle before making the incision—a trifling expedient that I have found very useful.

In certain cases there is a marked tendency of the fat layer to retract, thus leaving a space to be filled by serum or blood. This condition always interferes with primary union. It is more liable to occur in closure by laminated sutures (Fig. 441), where the supporting silkworm gut sutures have been omitted. This tendency can be avoided either by passing the interrupted sutures deeply into the tissues (Fig. 442), using the figure-of-eight suture in the first instance (Fig. 443), or by passing a continuous deep subcuticular suture (Fig. 444).

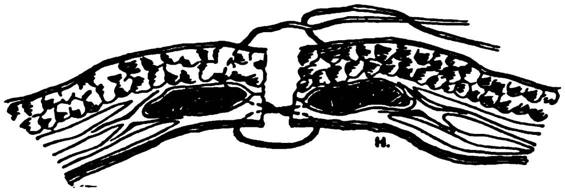


Fig. 443.—Layers to be Included in Each Loop of a Figure-of-eight Suture.

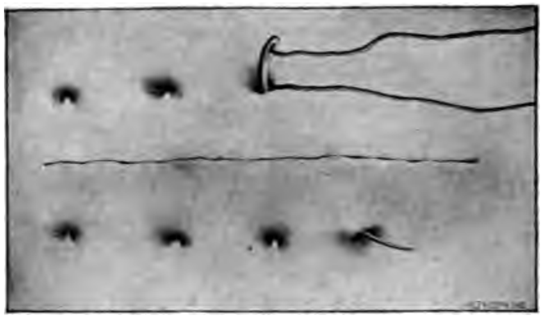


Fig. 444.—The Deep Subcuticular Approximation Suture to Control the Fatty Layer. The needle is reinserted through the aperture of exit, and is carried in a more or less oblique way back to the opposite side.

Fig. 445.—The Needle Devised by Dr. J. B. S. Holmes.

Annoying small hemorrhages can be avoided by making the closure with a needle that has no cutting edge. One of the most convenient needles that I have ever used for this purpose was devised by Holmes (J. B. S.). It is straight, slightly bent at the point, which is three-sided (Fig. 445).

DRAINAGE

Drainage was at one time considered more essential to success in abdominal surgery than it is at the present day. At the time when surgeons were less sure of hemostasis it was a safeguard in detecting internal hemorrhage, and it should yet be employed in all cases in which the operator has any doubt about having controlled the bleeding. In former times, when the toilet of the peritoneum was less carefully made than at present, drainage was essential for the escape of pus, which continued to form until limited by the self-extermination of its micro-organisms. Drainage may be practiced by leaving in the abdominal wound a glass tube extending to the bottom of the pelvis. Through this tube the accumulated fluids are sucked with an apparatus consisting of either a syringe or a rubber bulb with a glass barrel attached to a bit of rubber tubing. The manipulation requires great care to prevent infection, the liability to which by this means constitutes one of the chief objections to drainage as a routine measure. In many abdominal operations in which it is desirable to promote the escape of fluid drainage is effected by making an opening in the floor of the cul-de-sac of Douglas and inserting through that into the vagina either a small rope of gauze or, preferably, a T drainage tube. These are made of rubber after the pattern of Martin, but, as found in the shops, are unnecessarily expensive. Just as efficient a drainage tube can be made by taking a piece of ordinary quarter-inch drainage tubing, eight inches long, and cutting it off oval at one end. The tube is then split for a distance of an inch and a half into two flaps; an eighth of an inch below the base of each flap a small hole is cut into each side of the tube; through each of these holes the corresponding flap is drawn by means of an ordinary hemostatic forceps; the result is the formation of a T tube of great utility (Fig. 256). Delagenière has devised metal drainage tubes, but their advantages are not obvious. Gauze has been used for drainage purposes, but it speedily becomes filled with the secretions, which it fails to conduct out of the cavity; its use, therefore, should be limited to those cases in which the fluid expected to be taken out by it is not in excess of the absorbing capacity of the gauze to be used. J. G. Clark investigated the general question of drainage in seventeen hundred abdominal sections at the Johns Hopkins Hospital. In approaching his investigations he proceeded upon the conclusions of Muscatello, viz., (1) the surface of the peritoneum is equivalent to that of the skin; (2) it has an enormous absorbing function, taking up in an hour from 3 to 8 per cent. of the entire body weight; (3) under the influence of very toxic or very irritant substances an equal transudation into the peritoneal cavity may take place. Clark, from a general study of the subject, as well as from these investigations, concluded that:

(1) Fluids and solids may pass through the endothelial layer of the peritoneum, the fluids in many places, the solid particles only through the spaces in the diaphragm.

(2) The minute solid particles are carried into the mediastinal lymph vessels and glands, and thence into the blood circulation, by which they are distributed to the abdominal organs and lymph glands.

(3) Large quantities of fluids may be absorbed by the peritoneum in an astonishingly short time.

(4) The leukocytes are largely the bearers of foreign bodies from the peritoneal cavity into the mediastinal lymph glands.

As the result of the experimental study of infection of the peritoneum by Grawitz it has been shown that:

(1) The introduction of non-pyogenic organisms into the abdominal cavity, either in small or large quantity, or mixed with formed particles, produces no harm.

(2) Great quantities of organisms, which ordinarily produce no disturbance, may give rise to a general asepsis if the absorptive ability of the peritoneum is impaired.

(3) The injection of pyogenic organisms into the peritoneal cavity may be quite as harmless as injection of the non-pathogenic varieties.

Drainage by a tube in the abdominal wound is now but rarely employed, but when it is used a glass tube ¼ inch in diameter, with perforation on the lower inch, should be inserted down to the floor of the cul-de-sac. Through the tube the fluids are removed at frequent intervals by a suction apparatus. This manipulation is now generally obviated by draining down instead of up hill, or, in other words, it is done by making an opening in the cul-de-sac of Douglas and carrying a self-retaining tube, or a strand of gauze, out through the vagina. In other instances this will not suffice. Many operators still cling to the old glass tube and pump, while in certain other instances it is necessary to pack the gauze and bring one end of it out through the incision. The necessity for the latter expedient is sometimes so great as to make it necessary to leave a part or all of the incision open. In such cases it is not better to employ the buried animal suture, for the reason that the drainage, however established or however maintained, is necessarily a fruitful source of infection; and infection, once communicated to the continuous laminated animal suture, is liable to invade all of the structures that may be approximated by it.

DRESSING OF THE ABDOMINAL WOUND

The former cumbersome dressings with successive layers of gauze, cotton, and bandages are no longer employed. They are hot and un-

(2) Introduce the stomach tube.

(3) Fill the stomach with water alkalinized with sodium bicarbonate (1/3 to 1 pint) and let it empty. Repeat the process until no more mucus appears.

The patient should be transported with great care to her bed, where she should be surrounded with heat. It should be remembered that serious burns have occurred from placing hot water bottles too near an anesthetized patient. It should be adopted as a rule, to which there are no exceptions, that a hot water bottle or other medium for the application of heat should never be brought into direct contact with the skin of the patient.

Medicines, such as nitroglycerin, 1/100 grain, or strychnin sulphate, 1/30 grain, given hypodermically, may be demanded as heart stimulants either during the operation or immediately following.

Pain, always a prominent symptom following the withdrawal of the anesthetic in these cases, ought, whenever possible, to be controlled by the strong moral influence—the hypnotic suggestion—imparted by the surgeon or the nurse, by which means the patient can often be made either oblivious to pain or passively submissive to its pangs. Morphin and its congeners are invariably doubtful and generally dangerous remedies in abdominal surgery, as they arrest peristalsis, provoke vomiting, and prevent elimination. In certain extreme cases, however, they may be given as the lesser of two evils. A grain of the alcoholic extract of opium in a suppository often tranquilizes the patient with less incidental mischief than is observed from morphin. Neither atropin nor belladonna ought to be given, either singly or with other remedies, in these cases, as they inhibit the action of the non-striated fibers of the intestines, and, by their influence on the salivary secretion, augment the already distressing thirst. Trional or phenacetin may be given in doses of from 4 to 10 grains each. Fifteen grains each of chloral hydrate and potassium bromid, well diluted, may be given by rectum.

Laxatives are often required. Calomel, 1/10 grain every twenty minutes until a grain is taken, should be commenced at the expiration of thirty-six hours, or sooner in the presence of a rising temperature, followed in six hours by either magnesia sulphate or Apenta water, given preferably over ice and diluted with seltzer or Vichy water from a siphon. The cold and the carbonic acid gas tend both to obscure the taste of the medicament and to allay the irritability of the stomach. Three hours later an enema, consisting of either plain water or soap and water, with either turpentine or castor oil, may be given. A high enema of a solution of magnesia sulphate may be given in obstinate cases. If after twelve hours of effort by these means no action has been secured, and particularly if there is a tendency to distention, 5 grains meshed within it softens and permits its more ready withdrawal. The patient is saved much pain if, in the withdrawal of gauze, steady, firm traction with a twisting motion is practiced.

Dressings in a purely aseptic case, without drainage, ought not to be changed before the tenth day. In drainage cases, however, they frequently become soiled and require changing earlier, when great precaution should be observed to prevent contamination.

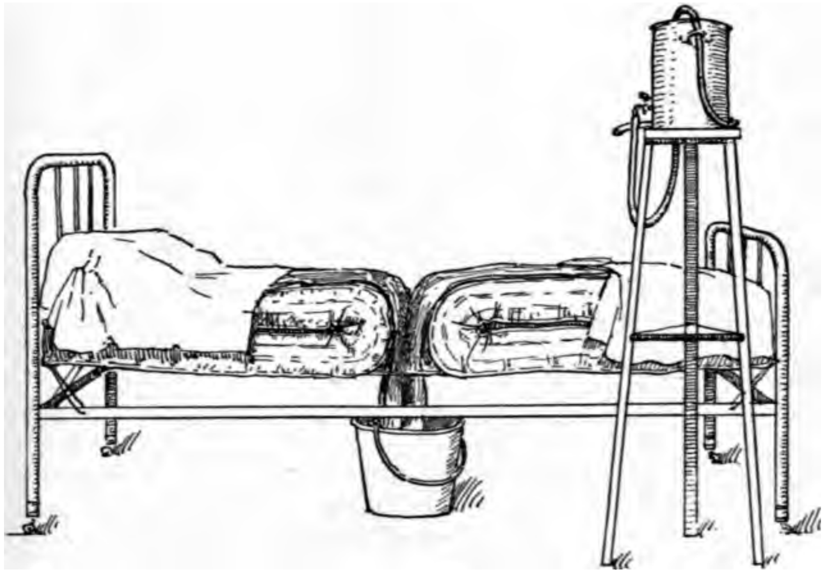


FIG. 448.—CONVENIENT ARRANGEMENT OF MATTRESSES FOR CONTINUOUS IRRIGATION.

Douches may be employed in all cases of drainage through the vagina after twelve hours, following the removal of the gauze or the tube from the cul-de-sac. In cases in which a tube is used, however, the vagina may be douched while the tube is *in situ*, care being taken to secure a free outflow of the water.

Diet, including drink, must be regulated according to the indications of the individual case. In the majority of instances it is better to keep everything out of the stomach during the first twelve or twenty-four hours, simply moistening the lips or washing out the mouth with fresh water. Hot water has a tendency to augment the thirst it was intended to alleviate.

Vomiting, largely due in these cases to gastritis induced by mucus and saliva saturated with the anesthetic and swallowed during the operation, is best relieved by washing out the stomach. This can be done

INDEX

Abbe, 402
Abdominal bandage, 868
  use of, following operation, 872
    following ovariotomy, 660
Abdominal hysterovaginectomy, procedure for, 562, 563
Abdominal incision, 855
  after-treatment of, 868-872
  drainage in, 866, 867
  dressing of, 867, 868
  inguinal, 858
  lumbocostal, 858, 859
  lumboiliac, 858
  median, procedure for, 859-862
  oblique subcostal, 858
  oblique ventral, 857, 858
  procedure for closure of, by interrupted through-and-through or en masse suture, 864, 865
    by laminated suture, 862-864
  transverse infraabdominal, 859
  transverse suprapubic, 857
  transverse umbilical, 856, 857
  vertical median, 856
Abdominal panhysterectomy, procedure for, 524-527
  Wertheim procedure for, 576-582
Abdominal pregnancy, 715. *See also* Ectopic pregnancy
Abdominal quadrants, 856
Abdominal supporter, for movable kidney, 258
  use of, following operation, 872
Abel, 393
Aberrant mamma of Luschka, 57
Abortion, aneurysmal varix due to repeated, 692
  attempted, endometritis following, 463
    foreign bodies in urethra due to, 140
    foreign bodies in uterus due to, 273
Abortion, attempted, streptococcus infection due to, 367
    wounds of uterus due to, 134
  chorioepitheliomata of the uterus following, 535, 537
  due to septate uterus, 24
  following myomectomy, 531
  in carcinomata of the uterus, 546
  in ectopic pregnancy, 716
  in presence of ovarian tumor, 641
  incomplete, menorrhagia following, 774
    metrorrhagia and, 778
  indications for, 710
  legal requirements for induction of, 710, 711
  procedure for induction of, by gauze pack, 712
    by incision of the cervix, 712
    Whitridge Williams, by dilatation and curettage, 711
  tubal, 719
  tuberculous peritonitis and, 415
Abscess, ischiorectal, in gonorrhea of the rectum, 320
  of the vulvovaginal gland, due to gonococcus infection, 301, 322, 323
  ovarian, due to *Bacillus coli communis*, 436
    pneumococcus and, 438
  pelvic, gonorrheal, 333, 334
    vesicovaginal fistula due to, 104
  perimetric, septic vibrion in, 442
  perinephritic, 474, 475
    treatment of, 480, 481
  perisalpingeal, 313, 314
  syphilitic, of the pelvic lymphatics, 355
  tuberculous, of the kidney, 406, 407
    of the pelvis, drainage of, 426
  tuboovarian, 314
Abscess formation in cystitis, 474

Alcohol, contraindicated, in mixed infection of the kidney, 477
    in treatment of dysmenorrhea, 790
    effect of, on the kidneys, 475
  use of, as application, in herpes progenitalis, 456, 457
    in menorrhagia, 777
    in puerperal infection, 383, 384
Alcoholism, dysmenorrhea and, 787
Alexander, 216
Aliquié-Alexander procedure for shortening the round ligaments, 216-218, 224, 225
  after-treatment of, 218
  modification of, 218
Alkalies, use of, in ureteral calculus, 281
  in vesical calculi, 277
Alkaline waters, in treatment of renal calculi, 288
Allis ether inhaler, 849
Altormyan's case of echinococcus infection, 487
Amann, 545, 616
Ameiss' case of double uterus, 25
Amenorrhea, 780-783
  acquired, 780
  in absence of ovaries, 34
  in infantile uterus, 23, 24
  in ovarian tumor, 646
  in rudimentary ovaries, 35
  in rudimentary uterus, 23
  in septate uterus, 24
  in tuberculosis of the Fallopian tubes, 412
  in tuberculous infection of the body of the uterus, 411
  in young girls, 781
  treatment of, 781-783
Ampullar pregnancy, 714, 715
Amyl nitrate, in treatment of dysmenorrhea, 790
Anal fistula, and tuberculosis, 407
Anastomosis, end-to-end, of ureter in ureterovaginal fistula, 114
  lateral, of the ureters, Monari procedure for, 155
  necessity of, in injuries of the ureter, 148
  uretero-intestinal, Reed procedure for, 156
Anastomosis, uretero-ureteral, Van Hook procedure for, 151, 152
  uretero-vesical, Guiteras procedure for, 152, 153
    Sampson procedure for, 153, 154
    Van Hook procedure for, 154, 155
Andrews, nitrous-oxid anesthesia first used by, 851
Andrews procedure for incomplete laceration of the perineum, 78
Anemia, amenorrhea due to, 781, 782
  following sarcoma of the bladder, 622
  in chorioepitheliomata of the uterus, 537
  in distoma-hematobium infection, 486
  in uterine myomata, 502
  menorrhagia due to, 772
    treatment of, 775
  metrorrhagia due to, 778
  treatment of, to relieve dysmenorrhea, 791
Anesthesia, by intravenous injection of hedonal, 854, 855
    procedure for, 855
  catheterization under, 827
  chloroform, 849
    Esmarch procedure for, 849, 850
  cocain, 850
    procedure for local, 850
    Tuffier procedure for spinal, 850, 851
  ether, 848
    procedure for, by the drop method, 848
      by the open method, 848, 849
  eucain, 850
  examination under, 814, 815
  gas-oxygen, for rudimentary ovaries, 35
  nitrous-oxid-oxygen, 851-854
    procedure for, 852, 853
  novocain, 850
  reaction secured by, in rupture of kidneys, 161
Anesthetizing chamber, 847
Aneurysm needles, 846
Aneurysmal varix, 691-693
  medical treatment of, 693
  surgical treatment of, 693

- Aneurysmal varix, surgical treatment of, procedure for, 694
  - symptoms and diagnosis of, 693
- Angiosarcoma of the kidney, 620
  - of the ovary, 618
- Anomalous anus, 55
- Anoscope, Martin, 832, 833
- Anteflexion of the uterus, 195, 196. *See also* Uterus
- Anterior rectocele, 185-187. *See also* Rectocele
- Anteversion of the uterus, 196
  - symptoms and diagnosis of, 201, 202
- Antitoxin in treatment of diphtheria of the vulva and vagina, 433
- Anuria in injuries of the bladder, 145
  - in ureteral calculi, 280
- Anus, absence of, 51
  - anomalous, 55
    - symptoms and diagnosis of, 55
    - treatment of, 55
  - atresia of, 51, 52
    - symptoms and diagnosis of, 53
    - treatment of, 53
  - chancroids at, 361
  - spirochæta pallida infection of, 355
  - stenosis of, 51, 52
    - procedure for, 53
    - symptoms and diagnosis of, 53
    - treatment of, 53
  - vulvar, 53
    - procedure for, 55
    - symptoms and diagnosis of, 54
    - treatment of, 54, 55
- Apenta water, postoperative use of, 869, 870
- Aphthæ of the vulva, 434
- Apiol in treatment of amenorrhea, 782
- Apostoli, 533
- Appendicitis, *Bacillus coli communis* and, 435
  - differentiation of gonococcus infection of the Fallopian tubes from, 325, 326
  - movable kidney mistaken for, 255
- Applicators, 821
- Arcelin, 287
- Areolar hyperplasia, menorrhagia due to, 774
- Aretæus, 754
- Argyrol, use of, in mixed infectio the kidney, 477
  - in tuberculous infection of the l der, 429
- Aristol, use of, in herpes progeni 456
- Aron, 424
- Arsenic, in treatment of anemia, 7
  - causing amenorrhea, 782
  - in treatment of infantile uteru
  - in treatment of intermenstrual 794
- Arteriosclerosis of the uterus, 708, *See also* Uterus
- Artificial vagina, procedures for,
- Asahara, 319
- Ascent of the uterus, symptoms diagnosis of, 203
- Asch, 563
- Aschoff, 612
- Ascites, complicating ovarian tu 642, 643
  - confusion of, with ovarian cyst, 649
  - displacements of the uterus du 194
  - in ovarian cysts, 635
  - in sarcomata of the ovary, 618
  - in tuberculous infection of the F pian tubes, 412
  - in tuberculous infection of the p peritoneum, 402, 414, 415
- Ashton, 17, 133, 795
- Ashton's case of a tent as a for body in the uterus, 273, 274
- Askanazy, 409
- Aspiration for evacuation of pu gonococcus infection, 339
- Aspirator, 822
- Atheromatous cysts of the labia jora, 666
- Atlees, 652
- Atmocausis, 469, 470
- Atresia of the anus, 51-53. *See* Anus
  - of the vagina, 17-19. *See also* gina
  - of the vulva, 2, 3. *See also* V absence and atresia of
- Atresia hymenalis, 7, 8
- Atresia vaginæ lateralis, 15

Atrophy of the endometrium following cervical lacerations, 124
  of the fimbriæ of the Fallopian tubes, 309
  of the mucosa of the Fallopian tubes, 309
  of the muscular tissue of the Fallopian tubes, in pyosalpinx, 314
  of the parenchyma of the cervix, following cervical lacerations, 123, 124
  of the posterior uterine wall, in retrodisplacement of the uterus, 194
  of the uterine wall, in anteflexion of the uterus, 196
  of the uterine wall, in flexion of the uterus, 230
  of the uterus, 708, 709
    at the menopause, 799
  of the vagina, 707
  of the vulva, 701-706. *See also* Vulva.
Atropin in treatment of constipation, 776
  in treatment of dysmenorrhea, 790
  in treatment of menorrhagia, 777
  use of, in nitrous-oxid-oxygen anesthesia, 852, 853
Atypical hymen, 5
Auvard procedure for laceration of the cervix uteri, 127, 128
Aveling, 754
Avicenna, 754
Axial rotation of ovarian tumors, 641

"B and B mixture," 429
Bacillus aerogenes capsulatus, 292, 293, 442, 445
Bacillus coli communis, 435
  bartholinitis due to, 457
  cystitis due to, 472, 473
  in gonococcus infection of the vulvovaginal gland, 301
  in the bladder, 317
  in the kidney, 319
Bacillus coli infection of the genitourinary organs, 435, 436
  symptoms and diagnosis of, 436, 437
  treatment of, 437
Bacillus diphtheriticus infection of the genitourinary organs, 433
Bacillus diphtheriticus infection of the genitourinary organs, symptoms and diagnosis of, 433
  treatment of, 433
Bacillus, Döderlein's, 292, 298
Bacillus Ducrey, 361
Bacillus Ducrey infection of the genitourinary tract, 361, 362
  confusion of carcinoma of the vagina with, 556
  diagnosis of, 363
  prognosis of, 363
  treatment of, 363, 364
Bacillus gonococcus, 297-299
  bartholinitis due to, 457
  intertrigo of the vulva due to, 446
Bacillus gonococcus infection. *See* Gonococcus infection
Bacillus, Klebs-Loeffler, 433
Bacillus œdematis maligni, 442
Bacillus prodigiosus, in treatment of inoperable sarcoma, 624, 625
Bacillus pyocyaneus, bartholinitis due to, 457
  in gonococcus infection of the vulvovaginal gland, 301
  in mixed infection of the kidneys, 474
Bacillus tuberculosis, 386
  in mixed infection of the kidneys, 474
Bacillus tuberculosis infection. *See* Tuberculous infection
Bacillus vaginalis, 292, 298
Bacini, 218
Bacteriology, normal, of the Fallopian tubes, 293, 294
    of the vagina, 291-293
    of the vulva, 291
    of the uterus, 293
Baer, 779, 800
Baisch, 727
Baldwin procedure for absence of vagina, 12-14
Baldy, 533
Baldy procedure for shortening the round ligaments, 225
Ballantyne, 4, 6, 14, 16, 17, 20, 21, 25, 26, 27, 34, 37, 53
Ballantyne's case of epispadias, 38
  of misplaced Fallopian tube, 30

Ballantyne and Williams' case of genital tuberculosis, 27
Ballantyne and Williams' cases of accessory ostia of Fallopian tubes, 29
Ballottement, in ectopic pregnancy, 721
Ballowitz, 48
Bandage, abdominal, 868
  following operation, 872
  following ovariotomy, 660
Bandl, 691, 728, 729
Bangs, 406
Bantock, 652
Bar, 735
Barbier, 387
Barnes, 641, 733, 737, 754, 758, 769
Barrett procedure for shortening the round ligaments, 222, 223
Bartholinitis, 299-301, 457
Baruch, 469
Basham's mixture, 288
Baths, during menstruation, 770, 771
Baudeloque, 737
Becker and Lennhoff, index of, 252
Béclère's case of renal calculi, 287
Beds with segmented mattresses, 870
Bell, John, 651
Belladonna, use of, in hemorrhoids, 696
Benbrook's case of gunshot wound of the uterus, 133
Benzoate of soda, use of, in mixed infection of the kidney, 477
Berggrün, 415
Bergh, 455
Berkeley and Bonney, 580
Berkeley and Bonney's pleating suture, 248
Berkeley and Bonney's procedure for replacement of displaced ovary, 248, 249
Bernard, Léon, 447
Bernhard's case of double uterus, 25
Bernutz, 713
Bettman, H. W., 704
Bichlorid of mercury compresses, use of, in folliculitis of the vulva, 454
Bichlorid poultices, use of, in mastitis, 483
Bicornate uterus. *See* Uterus, two-horned
Bier method of inducing hyperemia in mastitis, 482
Bilateral laceration of the cervix uteri, 125
Bilharzia, 486
Billroth, 620, 652, 662
Bimanual examination for anterior displacement of the uterus, 201
  for inversion of the uterus, 751
  for ovarian tumor, 646
  for parovarian cysts, 681
  for prolapse of the uterus, 202
  procedure for, 815, 816
Binnie, 152, 597, 600
Bladder, calculi in, 276-278
  carcinomata of, pathology of, 551, 552
    symptoms and diagnosis of, 559
    treatment of, 584
      Hagner procedure for removal of carcinoma at the fundus, 585, 586
      Mayo (C. H.) procedure of transperitoneal cystostomy, 587-590
      procedure for curettage through the urethra, 584, 585
      procedure for extirpation of the bladder, 590
      procedure for suprapubic cystostomy, 586, 587
      procedure for vaginal cystostomy, 585
  changes in, in prolapse of the uterus, 198
  condylomata in, 355
  contraction of, in vesicovaginal fistula, 103
  contusions of, cystitis due to, 471
  cystofibroma of, 551
  descensus of, in cystocele, 173
  distention of, differentiated from ovarian tumor, 650
    displacement of the uterus due to, 192
  distoma-hematobium infection affecting, 486
  disturbances of, in parovarian cysts, 681

- Bladder, examination of, 823
    - procedure for, by Kelly cystoscope, 824, 825
    - procedure for, by Nitze-Otis cystoscope, 825, 826
  - extroversion of, 40
    - symptoms and diagnosis of, 40
    - treatment of, compensatory operation for, 43
      - Maydl procedure for transplanting ureters in, 42, 43
      - medical, 40, 41
      - Tiersch procedure for, 41, 42
      - Trendelenburg procedure for, 41
  - fibromata of, 559
  - fibromyomata of, 551
  - foreign bodies in, 276
    - cystitis due to trauma produced by, 471
    - symptoms and diagnosis of, 276
    - treatment of, medical, 277
      - surgical, 277, 278
  - gonococcus infection of, 317-319
    - local or surgical treatment of, 350
    - medical treatment of, 349, 350
    - predisposing to tuberculous infection, 404
    - symptoms and diagnosis of, 327, 328
  - implantation of ureter in, in ureterovaginal fistula, 114
  - injuries of, 144
    - in course of Wertheim's operation for panhysterectomy, 580
    - symptoms and diagnosis of, 145
    - treatment of, 145
      - Guiteras procedure for, 145
  - invasion of, by sarcoma of the vagina, 613
  - irritability of, in perineal lacerations, 69
  - irritation of, in ovarian tumor, 647
  - lipomata of, 559
  - malformations of, 40-45
  - mixed infection of, 471-474
    - nephritis associated with, 476
  - mucous patches in, 355
  - myomata of, 559
  - myxomata of, 551, 552
  - papilloma of, 552
    - diagnosis of, 559
- Bladder, prolapse of, accompanying prolapse of the uterus, 198, 199
    - in vesicovaginal fistula, 102
  - rhabdomyoma of, 551
  - sarcomata of, occurrence of, 551, 552
    - pathology of, 620
    - symptoms and diagnosis of, 622
    - treatment of, 623, 624
  - spirochæta pallida infection of, 355
  - staphylococcus infection of, predisposing to tuberculous infection, 404
  - streptococcus infection of, predisposing to tuberculous infection, 404
  - tuberculous infection of, pathology of, 404, 405
    - symptoms and diagnosis of, 417, 418
    - treatment of, 428-430
  - ulcerations of, vesicovaginal fistula due to, 104
- Bland Sutton, 29, 307, 309
- Blind, 727
- Blood cysts of the corpus luteum, 673
- Bloodgood, 555
- Bloodgood's classification of carcinomata of the breast, 554
- Bloodgood's statistics on results of extirpation of breast and glands for carcinoma, 607, 608
- Bloom, 796
- Blot, 27
- Bluhm, 626
- Blumen, 626
- Blundell, 746
- Bockhart, 297, 319, 453
- Bodenstein, Oskar, 331
- Boils, differentiation of chancre from, 357
  - in folliculitis of the vulva, 453
- Boisleux, 440
- Bonney, Berkeley and, 580. *See also* Berkeley and Bonney
- Boric acid, in treatment of endometritis, 468
- Boroglycerid in treatment of intermenstrual pain, 794
- Bouchard, 355
- Bougies, ureteral, 829

Brues, 393
Bruhn, 611
Bryant, Thomas, 598
Bubo, 355
  chancroidal, 362
Bulbocavernosus muscle, 65
Bulius, 636, 672
Bulkley, 485
Bullitt, 630
Bumm, 297, 298, 301, 317, 365, 368, 370, 371, 372, 374, 402, 472, 581
Bumm's case of gonorrheal inflammation of the vulvovaginal gland, 300
Burrow's solution for intertrigo of the vulva, 448
"Buttermilk discharge" in vaginitis, 457
Byford's method of rectal puncture, 339
Byrne procedure for ignohysterectomy, 569-572

Calcification of an ectopic ovum, 716, 722
Calcium lactate, in arteriosclerosis of the uterus, 709
Calculi, in the urachus, 289
  in the vagina due to vesicovaginal fistula, 104
  mixed infection of the kidneys and, 475
  renal, 285-288
    associated with ureteral calculi, 279, 280
    differentiation of, from mixed infection, 476
    symptoms and diagnosis of, 286, 287
    treatment of, medical, 287, 288
      surgical, 288
  ureteral, 279, 280
    symptoms and diagnosis of, 280, 281
    treatment of, 281, 282
      Nitze procedure for, 282
      ureterostomy by the extraperitoneal route for, 282, 283
      ureterostomy by the transperitoneal route for, 283, 284
      ureterostomy by the vaginal route for, 284
Calculi, urethral, 275
    symptoms and diagnosis of, 275
    treatment of, 275
  vesical, 276
    cystitis due to trauma produced by, 471
    medical treatment of, 277
    surgical treatment of, 277, 278
    vesicovaginal fistula following operation for, 103
Calomel in treatment of fecal tumors causing menorrhagia, 776
  postoperative use of, 869, 870
"Caked breast," staphylococcus infection differentiated from, 481
Cameron, Murdock, 733, 737
Cameron procedure for Cesarean section, 739-742
Camphor in treatment of dysmenorrhea, 790
Camphorated alcohol, use of, in herpes progenitalis, 456
Canal of Nuck, 218, 247
Cannabis indica, in treatment of dysmenorrhea, 790
Canquoin, 468
Capillary piles, 695
Carbolic acid, use of, in arteriosclerosis of the uterus, 709
  in eczema of the vulva, 451
  in erysipelas of the vulva and vagina, 381
  in erythema of the vulva, 450
  in kraurosis vulvæ, 705
  in procedure to arrest hemorrhage in inversion of the uterus, 752
Carcinoma causing rupture of the uterus, treatment of, 731
  complicating lacerations of the cervix uteri, 124
  confusion of, with tuberculosis of the body of the uterus, 412
    with tuberculosis of the cervix uteri, 409
  development of, in adenomyomata, 498
  differentiation of tuberculosis of the vulva from, 409
  injuries of the urethra due to excision of, 140
  of the bladder, pathology of, 551, 552

- Catheterization in urethrovaginal fistula, 121
  - of the ureters, disadvantage of, 829
    - Kelly procedure for, 826, 827
    - Nitze procedure for, 827
  - renal, for diagnosis of carcinomata of the kidney, 559
  - urethral, for differentiating hydronephrosis and ovarian cyst, 649
- Cattle horn wounds of the uterus, 133
- Cauterization in adenomata of the rectum, 665
  - in carcinomata of the uterus, 565, 566
    - Byrne procedure for, 569-572
  - in chancroids, 363
  - in kraurosis vulvæ, 705
  - in membranous dysmenorrhea, 793
  - in tuberculous infection of the vulva and vagina, 423
  - of cysts of the uterus, 669
  - of tuberculous ulcers of the rectum, 431
  - of ulcers in tuberculous infection of the uterus, 424
  - of uterus, preparatory to vaginal hysterectomy, 572
- Cautery and clamp procedure for hemorrhoids (Tuttle), 698, 699
- Cautery and ligature method for removal of hemorrhoids, 697, 698
- Cazeaux, 737
- Cazeaux's case of pudendal hematocele, 62
- Cazin, 537
- Celiohysterectomy, 746, 747
  - procedure for, 747, 748
- Celiohysterotomy, procedure for, 743-746
- Cervical canal, hypertrophy of, due to laceration, 122
- Cervical stenosis due to anteflexion of the uterus, procedures for relief of, 233-235
- Cervix uteri, carcinomata of, 544
    - indication for Cesarean section, 738
    - procedure for ignohysterectomy for, 569-572
  - changes in, in prolapse of the uterus, 198
- Cervix uteri, chronic dilatation of, endometritis following, 464
  - cystic, 669
  - dilatation of, for diagnosis of arteriosclerosis of the uterus, 709
  - gummata of, 354
  - high amputation of, 566
    - procedure for, 567
    - Segond procedure for, 567-569
  - incision of, for exploration of the uterus, 709
  - lacerations of, 122-124
    - accompanying rupture of the uterus during labor, 728
    - endometritis following, 464
    - menorrhagia due to, 774
    - symptoms and diagnosis of, 124-126
    - treatment of, 126
      - Auvard procedure for, 127, 128
      - Emmet procedure for, 126, 127
      - Schroeder procedure for, 128, 129
  - myomata of, procedure for vaginal myomectomy for, 527
  - polypi of, procedure for extirpation of, 531
    - by écraseur, 531, 532
  - procedure for induction of abortion by incision of, 712
  - sarcomata of, 614, 615
  - tuberculosis of, pathology of, 390, 391
    - symptoms and diagnosis of, 409, 410
  - vicarious menstruation from, 795
  - ulcerations of, menorrhagia due to, 774
- Cesarean section, 733, 734
  - Cameron procedure for, 739-742
  - conditions demanding, 737, 738
  - in carcinoma of the uterus, 547, 575, 576
  - location of placenta and, 738
  - Mann procedure for, 743-746
  - preparation of patient for, 738
  - Sänger procedure for, 742, 743
  - vaginal, 748
- Chadbourne, 796
- Chadwick, Freund and, case of, of echinococcus infection, 487

Cocain anesthesia, local, 850
  spinal, 851
Coccydinia, in ovarian displacement, 247
Codein, use of, after ovariotomy, 660
Coe, 345, 628, 629, 677
Coffee, per rectum, following Cesarean section, 746
Coffey procedure for combined shortening of the round and broad ligaments, 225-227
Coffey procedure of vaginal cuneihysterectomy for anteflexion of the uterus, 235, 236
Cohn, 617
Cohnheim, 636
Cohnstein, 769
Cold, in treatment of mastitis, 482
Coley's toxin treatment of inoperable sarcoma, 624, 625
Colloid adenocarcinoma, 554
Colloid cysts, 630
Colloid degeneration in endothelioma of the ovary, 619
  in sarcoma of the uterus, 616
Colon bacillus. *See* Bacillus coli
Coloptosis, associated with retrodisplaced uterus, 230
  movable kidney due to, 254
Colostomy in carcinoma of the rectum, 598
  in tuberculous infection of the rectum, 431
Colpeurynter for reducing uterine inversion, 754
Colpohysteropexie, Boursier procedure for anterior, 184
Colporrhaphy, superior, Reed procedure for, in prolapse of the uterus, 239-242
Coma, uremic, death from, in polycystic kidney, 687
Comby, 253
Conception following partial removal of the ovaries, 676
Condylomata, 356
  in the bladder, 355
Condylomata accuminata, due to gonococcus infection, 299
  removal of, 333
Condylomata lata, 356
Constipation accompanying prolapsus of the uterus, treatment of, 237
  amenorrhea due to, 782
  anterior rectocele and, 186
  habitual, varicocele and aneurysmal varix due to, 692
  in carcinoma of the rectum, 560
  in movable kidney, 255, 257, 258
  in ovarian tumor, 647
  in piles, 696
  in renal calculi, 286
  in retrodisplacements of the uterus, 200
  postoperative, treatment of, 870
  relief of, preceding operation, 841, 842
  treatment of, 776
    at the menopause, 803
  uterine displacement due to, 191
Contracted pelvis, Cesarean section in, 737
Contractions of suspensory structures of the uterus, in displacements of the uterus, 195
Contusions of the kidneys, 158, 159. *See also* Kidneys
  of vulva, due to rape, 60
Convalescence, after abdominal operations, 872
Cook, 792
Cooper, 554
Cordier, 630, 751
Cornil, 391, 393, 409, 424
Corning, J. Leonard, 850
Cornual pregnancy. *See* Ectopic pregnancy
Corporeal tuberculosis, 392-394
Corpus luteum, cysts of, 672, 673
Corpus Rosenmüller, 677. *See also* Parovarium
Corsets, movable kidney and, 253
Cough, in tuberculous infection of the rectum, 419
Coughlin, 792
Crab louse, 485
Cragin, 49
Craig, 445
Crampton, 751
Craniotomy, 734
  in rupture of the uterus, 730

Cystic ovaries, 670-676. *See also* Ovaries, cystomata of
Cystitis, 471-474
  bacteriology of, 317, 318
  chronic, treatment of, 334
  diphtheritic, 319, 474
  following curettage of the bladder, 585
  gonorrheal, 317-319
    local or surgical treatment of, 350
    medical treatment of, 349, 350
  nephritis associated with, 476
  tuberculous, 318, 319, 473, 474
  vesicovaginal fistula following operation for, 103
Cystocele, 173-175
  accompanying displacement of the uterus, 194
  anterior rectocele accompanying, 185, 186
  cystitis due to, 471
  symptoms and diagnosis of, 175
  treatment of, 175, 177
    Goffe procedure for, 176-179
    Hirst procedure for, 180, 181
    post-operative, 184, 185
    procedure for restoration of the bladder wall in cystocele complicating prolapse of the uterus, 182-185.
    purse-string procedure for, 182
    Sutton procedure for, 179-181
Cystofibroma of the bladder, 551
  of the broad ligament, 500
Cystomata of the breast, 688, 689
  of the Fallopian tubes, 670
  of the kidney, 685-687
    symptoms and diagnosis of, 687
    treatment of, 687
  of the ovaries, 670-676. *See also* Ovaries
  of the parovarium, 676-684. *See also* Parovarium
  of the rectum, 689
  of the round ligament, 684
    treatment of, 684
      Volbrecht procedure for, 685
  of the uterus, 669. *See also* Uterus
  of the vagina, 666-668. *See also* Vagina
  of the vulva, 666
Cystomyoma of the broad ligament, 500
Cystoscope, Kelly, 823, 824, 825
  Nitze operating, 623
  Nitze-Otis, 823, 825, 826
  with attachment for catheterization of the ureters, 825
Cystoscopic examination for tuberculous infection of the bladder, 417
  for tuberculous infection of the kidney, 419
  with Kelly cystoscope, 824, 825
  with Nitze-Otis cystoscope, 825, 826
Cystostomy, suprapubic, procedure for, in carcinoma of the bladder, 586, 587
  transperitoneal, C. H. Mayo procedure for, 587-590
  vaginal, in carcinomata of the bladder, 585
Cysts, ascent of the uterus due to, 203
  atheromatous, of the labia majora, 666
  colloid, 630
  dermoid, of the ovary, 638-640. *See also* Embryomata
  displacement of the Fallopian tubes due to, 245
  echinococcus, 487, 488
    treatment of, 489
  follicular, of the ovaries, 671, 672
    of the uterus, 669
  in endothelioma of the ovary, 619
  in pelvic tuberculous peritonitis, 403
  of the corpus luteum, 672, 673
  of the Graafian follicle, 671, 672
  of the mesentery, differentiated from ovarian cysts, 649
  proliferating, 630
  pseudomucinous, 630
  sarcomata of the ovary and, 618
  serous (proliferating), 634-636
  tuboövarian, 310, 311, 673, 674
Czerny, 730
Czerniewski, 365, 368

Da Costa, 785
Dartigues, 49
Davidsohn, 389
Deaver, 435

Debility, menorrhagia due to, 772
    treatment in, 775
Decapsulation, fixation of movable kidney by, 262
Decidua, formation of, in ectopic pregnancy, 718
    in tubal pregnancy, 716, 717
  shedding of, in ectopic pregnancy, 718, 720
Decidua menstrualis, 766, 769
Deciduoma malignum, 535
Deciduosarcoma, 535
Deep subcuticular suture, 865
Delagenière's drainage tube, 866
Delamere, 395
Delbet procedure for extraperitoneal exposure of the ureter by the sacral route, 150
Demme, 387
Dénucé's cases of foreign bodies in the bladder, 276
Denudation operations for complete laceration of the perineum, 89-94
  for incomplete lacerations of the perineum, 74-82
Deodorants, use of, in carcinoma of the rectum, 597
Depas, 456
Depaul, 737
Depressor, 822
Dermatitis, in gonococcus infection of the vulva and vagina, 321
  intertrigo and, 448
Dermoid cysts of the breast, 689
  of the labia majora, 666
  of the ovary, 638-640. *See also* Embryomata
    malignant degeneration of, 644, 645
  of the vagina, 667
Descensus of the bladder, in cystocele, 173
  of the ovaries into labia majora, 4
  of the rectum. *See* Prolapse of the rectum
  of the uterus, 193
    pathology of, 197
De Sinerty, 388, 770
Desplans, 402
Deutsch, 731
Dewille, 395
Diarrhea in carcinoma of the rectum, 560
  in distoma-hematobium infection, 486
  treatment of, at the menopause, 803
Diet, after operations, 871, 872
  in causation of renal calculus, 285
  in erythema of the vulva, 450
  in mixed infection of the kidney, 477
  in tuberculosis, 421, 422
Dietl's crises, 255
Diffused cancer of the kidney, 553
Diffused exulcerated chancre, 353
Digital exploration, examination by, 813-816
  for prolapse of the uterus, 202
  for retrodisplacement of the uterus, 201
  Potter procedure for bimanual, 815, 816
  Potter procedure for examination of the vagina by, 814
Dilatation, curettage and, Whitridge Williams procedure for induction of abortion by, 711
  of cervical stenosis, 789
  of cervix, endometritis following, 464
  of urethra, for removal of foreign bodies from the bladder, 278
  of uterine canal in inverted uterus, 755
  of uterus, lacerations of the cervix due to, 122
  of vagina and uterus in imperforate hymen, 7, 8
Dilator, 821, 822
  Goodell, 821
  Otterbridge, 234
  Outerbridge, 408
  urethral, Kelly's, 823, 824
  use of, following divulsion and curettage of the uterus, 234
Diphtheria of the vulva and vagina, 433
Diphtheritic cystitis, 319, 474
Diplococcus of Neisser, 297-299. *See also* Gonococcus infection
Discharge, in adenoma malignum, 629
  in adenoma of the rectum, 665
  in atrophy of the vagina, 707
  in Bacillus Ducrey infections, 361

Discharge, in carcinoma of the rectum, 560
  in carcinoma of the urethra, 558, 559
  in carcinoma of the uterus, 556, 557
  in chorioepitheliomata of the uterus, 537
  in ectopic pregnancy, 718
  in eczema of the vulva, 450, 451
  in gonococcus infection of the rectum, 320, 329
  in gonococcus infection of the vulva and vagina, 321
  in gonococcus infection of the vulvovaginal glands, 322
  in intertrigo of the vulva, 447
  in mixed infection of the uterus, 465
  in rupture of the uterus during labor, 729
  in sarcomata of the uterus, 615
  in tuberculous infection of the body of the uterus, 411
  in tuberculous infection of the rectum, 419
  in vaginitis, 457, 458
Dispareunia, due to vaginal rupture, 101
Displacements of the Fallopian tubes, 244, 245. *See also* Fallopian tubes
  of the kidney, 250-263. *See also* Kidney
  of the uterus, 188-243. *See also* Uterus
  of the vagina, 171-187
Dissecting forceps, 844, 845
Distoma-hematobium infection of the generative organs, 486
  treatment of, 486
Distortion of the pelvis, rupture of the uterus during labor due to, 728
Dittrich, 548
Diuresis following rupture of a parovarian cyst, 682
Diverticula of the Fallopian tubes, 29, 30
Divulsion, curettage and, of the uterus, 233
    procedure for, 233-234
    after-treatment of, 234
  treatment of carcinoma of the rectum by, 598
Divulsion, treatment of dysmenorrhea by, 792
Döderlein, 299, 304, 580, 581
  Bacillus vaginalis of, 292, 298
Doleris, 343, 673
Doran, 548, 617, 641, 649
Dorsal flexed position, 808, 809
Dorsal position, extreme, 811
  with extreme flexure of the legs, 811
Dorsal prone position, 808
Double locked ligature, 348, 349
Double uterus, 24, 25
Double vagina, 14-16
Double vulva, 3
Douche, before examination, 807
  bichlorid, in treatment of distoma-hematobium infection, 486
  following divulsion and curettage of the uterus, 234
  following extirpation of uterine polypi, 532
  following operation for cystocele, 184
  hot water, in cervical lacerations, 126
  in carcinoma of the vagina, 564
  in displacements of the uterus, 204
  in gonococcus infection, 332
  in gonorrheal cystitis, 350
  in herpes progenitalis, 456
  in vaginitis, 458, 459
  postoperative, 871
Douglas, 45, 643
  cul-de-sac of. *See* Cul-de-sac
Dowd, 329
Doyen, 435, 439
Drainage, in abdominal operations, 866, 867, 870, 871
  following enucleation of myomata of the broad ligament, 533, 534
  following extirpation of the breast for carcinoma, 608
  following ovariotomy, 659
  following suprapubic cystostomy, 587
  gauze, 866, 870, 871
    following abdominal panhysterectomy, 526
  of the bladder, per vaginam, 429, 430
Drainage and puncture procedures for gonococcus infection, 334-342
Drainage tube, 866, 867
  methods of making, 340-342
  T, 336, 866

Dranitzin's case of epispadias, 38
Dressing of abdominal wound, 867, 868, 871
  of wound following extirpation of the breast for carcinoma, 608
Drysdale, 633
Dudley, A. P., 691, 692, 789
Dudley procedure for anteflexion of the uterus, 234, 235
  for lacerated perineum, 80, 81
Dudley (A. P.) treatment of pelvic varicocele and aneurysmal varix, 693
Dührssen, 547, 563
Dujon, 301
Duke hysteroscope, 820
Duke modification of the Tait flap-splitting procedure for incomplete laceration of the perineum, 87, 88
Duncan, Matthews, 354, 628, 785
Duning, 532
Dunlap, 647, 652
Duplication of the ureters, 46
Dwight, 691
Dykes' case of a calculus in the urachus, 289
Dysmenorrhea, 784-787
  due to cervical stenosis induced by anteflexion of the uterus, 233
  due to gonococcus infection of the uterus, 302
  due to misplacement of Fallopian tube, 31
  hygienic treatment of, 787, 788
  in anterior displacements of the uterus, 201
  in defective development of Fallopian tube, 28
  in infantile uterus, 23
  in mixed infections of the uterus, 462, 465
  in septate uterus, 24
  membranous, 461, 791, 793
  treatment of, 787-791
Dyspepsia, amenorrhea and, 781
  associated with movable kidney, 257
  dysmenorrhea and, 791
  treatment of, at the menopause, 803
Dyspnea in polycystic kidney, 687
Dystocia, due to misplaced kidney, 49
Dystocia, enlargement of bony outlet in, 734
    by pubiotomy, 735-737
    by symphysiotomy, 734, 735
  surgical interference in, 733-743
Dysuria, in retrodisplacements of the uterus, 200
  in urethral calculus, 275

Ear, vicarious menstruation from, 796
Earp's case of urethral calculus, 275
Ecchymoses in rupture of the kidneys, 160
Echinococcus cysts, differentiation of ovarian tumors from, 649, 650
  of the broad ligament, 489
  of the uterus, 669
Echinococcus infection of the generative organs, 487
  symptoms and diagnosis of, 487, 488
  treatment of, 488, 489
Eckhard, 619
Ecraseur, procedure for extirpation of cervical polypi by, 531, 532
Ecthyomatous chancre, 353
Ectopia vesicæ. *See* Bladder, extroversion of
Ectopic pregnancy, 713-718
  differentiation of gonococcus infection of the Fallopian tubes from, 325
  due to tubal ostia or diverticula, 30
  histology of, 717, 718
  in supernumerary Fallopian tube, 30
  rupture of Fallopian tubes due to, 136
  symptoms and diagnosis of, 718-722
  treatment of, 722-726
    after rupture, 724
    at time of rupture, 723
      McMurtry procedure for, 723, 724
    before rupture, 723
    in advanced cases, 724-726
Ectropion, 122
Eczema, folliculitis of the vulva following, 452, 453
  intertrigo and, 447, 448
  of the vulva, 450, 451
    treatment of, 451, 452

Eczema intertrigo. *See* Intertrigo
Eczema marginatum, 484, 485
Edebohls, 251, 258, 413, 415
Edebohls' procedure of fixation of the kidney by decapsulation, 262, 263
Edema, of the extremity in ovarian tumor, 647
  uterine, in prolapse of the uterus, 198
    in retrodisplacement of the uterus, 194
Edridge-Green's case of absence of one Fallopian tube, 27
Edwards, 554
Ehrendorfer, 551, 611
von Eiselberg, 365, 444
Electric cautery in treatment of adenoma of vulva, 626
Electricity for dilatation of cervical stricture, 789
  in treatment of infantile uterus, 24
  in treatment of membranous dysmenorrhea, 793
  in treatment of menorrhagia, 777
  in treatment of myomata of the broad ligament, 533
Elephantiasis, differentiation of myomata of the vulva from, 491, 492
  tuberculosis of the vulva and, 388, 409
Elephantiasis arabum, 486, 487
Elevated papule, 353
Elsner, 433
Elsner's case of vesical calculi, 277
Emanual, 4
Emboli, formation of, in puerperal infection, 369
Embryomata, 733
  ovarian, 638-640
    complications of, 640-645
    symptoms and diagnosis of, 645-651
    treatment of, 651-661
Embryonic inclusions giving rise to adenomyomata, 496
Embryotomy, 733
Emerich, 365
Emmenagogs, 782, 783
Emmet, 122, 239, 469, 789
  on uterine support, 190
Emmet curette forceps, for removal of foreign bodies from the uterus, 274
Emmet procedure for complete laceration of the perineum, 89, 90
  for incomplete tears of the perineum, 72, 73, 76-78
  for laceration of the cervix, 126, 127
  for morcellement, 529, 531
  for urethrocele and for prolapse of the urethra, 172, 173
Emotion, menorrhagia due to, 773, 775
Emphysematous gangrene, due to septic vibrion, 442
Emphysematous vaginitis, 458
Emplastrum hydrargyri, 360
Enchondromata of the breast, 690
Endarteritis, in polycystic degeneration of the kidney, 686
Endometritis. *See* Uterus, mixed infection of
  dysmenorrhea due to, 786
  exfoliative, 461
  fungous, 463
  glandular hypertrophic, 463
    due to gonococcus infection of the uterus, 303
    in prolapse of the uterus, 198
  granular, accompanying cervical stenosis, 233
  membranous dysmenorrhea and, 791
  puerperal. *See* Puerperal infection
  putrid, 370, 371
  senile, 469
  septic, 370, 371
  tuberculous, 392-394
Endometritis dolorosa, 465
Endometritis papulosa et tuberosa, 354
Endometrium, menstruation and, 766
  inflammation of, menorrhagia due to, 774
  structure and function of, 460, 461
Endophlebitis, 692
Endosalpingitis, 304
Endothelioma, lymphatic, of the kidney, 620
  of the ovary, 618, 620
  of the uterus, 616, 617
  of the vagina, 614
  vascular, of the kidney, 620

Enemata in treatment of fecal tumors causing menorrhagia, 776
  postoperative, 869, 870
  use of, preliminary to examination, 807
Engelmann, 533
En masse suture, procedure for closure of abdominal incision by, 864, 865
Enterocele, differentiation of vaginal cysts from, 668
  vaginal, 267-270. *See also* Intestines, displacements of
Enteroptosis, 267
  displacement of the uterus due to, 192
  prolapse of the uterus and, 197
Enterovaginal fistula, 118
  symptoms and diagnosis of, 118
  treatment of, 118
    procedure for, 118, 119
Enucleation of cystomata of the vagina, procedure for, 668, 669
  of intraligamentary parovarian cysts, 682, 683
  of myomata of the broad ligament, 533
Enuresis, nocturnal, a symptom of fusion of the clitoris, 3
Epispadias, 38
  symptoms and diagnosis of, 39
  treatment of, 39
Epistaxis, as vicarious menstruation, 795, 796
Epoophoron, 677. *See also* Parovarium
Eppinger, 628
Ergot in treatment of arteriosclerosis of the uterus, 709
  in treatment of menorrhagia, 776
  use of, in Cesarean section, 745
Ernst, 777
Erosions, superficial or chancrous, 352, 353
Erysipelas, of the uterus. *See* Streptococcus infection of the uterus
  of the vulva and vagina, pathology of, 366, 367
    symptoms and diagnosis of, 376
    treatment of, 380, 381
  toxins of, in treatment of inoperable sarcoma, 624, 625
Erythema of the vulva, 449, 450
  treatment of, 450
Escharotics, use of, in treatment of mixed infections of the uterus, 467-470
Escherich, 317, 472
Eserin sulphate, postoperative use of, 870
Esmarch procedure for administration of chloroform, 849, 850
Esmarch's chloroform inhaler, 849
Ether, intravenous injection of, 855
  procedure for administration of, by the drop method, 848
    by the open method, 848, 849
Ether anesthesia, 848, 849
Eucain anesthesia, 850
Europhen, use of, in herpes progenitalis, 456
Examination of the patient, 805
  by digital exploration, 813-816
    Potter procedure for vaginal, 814
    procedure for bimanual, 815, 816
  by inspection, 811, 812
  by palpation, 812, 813
  douche in, 807
  equipment for, 806, 807
  history of case, 805
    record form for, 805, 806
  instrumental, of the vagina and uterus, 817
      aspirator in, 822
      curette in, 822
      dilator in, 821, 822
      sound in, 820, 821
      speculum in, 817-820
      stethoscope in, 822, 823
  of the bladder, 823
    procedure for, with Kelly cystoscope, 824, 825
      with Nitze-Otis cystoscope, 825, 826
  of the rectum, 830-837
    Martin procedure for instrumental proctoscopy, 832-837
    Martin procedure of non-instrumental proctoscopy, 830-832
    procedure for combined digital examination of rectum and vagina, 837, 838
  of the ureters and kidneys, by catheterization, 826, 827

Examination of the ureters and kidneys, by catheterization,
    Kelly procedure for, 826, 827
    Nitze procedure for, 827
  of the urethra, 823
  of urines by segregation, 827-830
    Harris procedure for, 829
  position for, dorsal flexed, 808, 809
    dorsal prone, 808
    dorsal, with extreme flexure of the legs (Simon's), 811
    extreme dorsal (Trendelenburg), 811
    knee-chest, 810
    knee-elbow, 810
    left lateral prone (Sims), 809
    standing, 810, 811
  preparation of hands of examiner for, 807, 808
  preparation of patient for, 807
Exfoliative endometritis, 461
Exploratory incision in abdominal tumors, 651
  in ectopic pregnancy, 722
  in ovarian tumor, 645
  in polycystic kidney, 687
Exploratory puncture, 649
  of abdominal cysts, contraindicated, 651
Extracapsular fixation of the displaced kidney, procedure for, 259, 260
Extraperitoneal exposure of the ureter by the lumbo-ilio-inguinal route, Morris procedure for, 149, 150
  by the sacral route, Delbet procedure for, 150
Extrauterine pregnancy. *See* Ectopic pregnancy
Extravasation, perinephric, in rupture of the kidneys, 161
Extreme dorsal position, 811
Extrophy of the bladder. *See* Bladder, extroversion of
Extroversion of the bladder, 40-43. *See also* Bladder
Exudation in displacements of the uterus, 196

"Falling of the womb," anterior rectocele confused with, 186
Fallopian tubes, absence of one, accompanying absence of one ovary, 34
Fallopian tubes, absence of one, accompanying single kidney, 48
  absence and defective formation of, 27
    symptoms and diagnosis of, 28
    treatment of, 28
  actinomycosis infection of, 490
  anatomical considerations of, 27
  bacillus coli infection of, 435, 436
  carcinomata of, pathology of, 548
    symptoms and diagnosis of, 558
    treatment of, 582
  congenital misplacement of, 30
    symptoms and diagnosis of, 31
    treatment of, 31, 32
  cystomata of, 670
  displacements of, 244
    symptoms and diagnosis of, 245
    treatment of, 245
  dysmenorrhea due to disease of, 786
  gonococcus infection of, 304-315
    mixed infection following, 470
    symptoms and diagnosis of, 323-326
  gummata in, 355
  hernia of, 30, 31
  infection of, displacement due to, 244, 245
    displacements of the uterus due to, 192
  injuries of, 136-138
  involvement of, in prolapse of the uterus, 198
  ligation of, for sterilization, 137, 138
  malformations of, 27-32
  misplaced, removal of, 32. *See also* congenital misplacement of
  mixed infection of, 470
  normal bacteriology of, 293, 294
  pneumococcus infection of, 438
  pregnancy in. *See* Ectopic pregnancy
  removal of, for infections, 342-345
    indications for, 345, 346
    Tait procedure for, 346-349
    in advanced gonococcus infection, 333
    in streptococcus infection, 384
  rôle of, in menstruation, 767, 768
  rudimentary, accompanying rudimentary ovaries, 35

Fibroid type of tuberculous peritonitis, 404
Fibroids. *See also* Myomata
  ascent of the uterus due to, 203
  causing rupture of the uterus during labor, 728
    treatment of, 731
  complicating lacerations of the cervix uteri, 124
  differentiation of gonococcus infection of the Fallopian tubes from, 325
  displacement of Fallopian tubes due to, 245
  recurrent, 617
  uterine, inversion of the uterus due to, 749
Fibroma molluscum of the vulva, 492
Fibromata. *See also* Myomata
  of the bladder, 559
  of the uterus, abortion indicated in, 710
    Cesarean section indicated in, 738
Fibromyomata. *See also* Myomata
  interstitial, 494
  intraligamentous, 495
  of the bladder, 551
  of the broad ligament, 500
  of the uterus, sarcomatous degeneration of, 617
  subserous, 494, 495
Fibrosarcomata of the ovary, 617, 618
  of the rectum, 553
  of the vulva, 611
Figure-of-eight suture, 865
Filaria sanguinis hominis infection of the generative organs, 486, 487
  treatment of, 487
Fischel, 678, 680
Fischer, 301
Fischer's solution, 161, 162, 839
  procedure for intravenous infusion of, 840, 841
  use of, in rupture of the kidney, 161, 162
Fistulæ, 144
  anal, and tuberculosis, 407
  congenital vesicoabdominal, 44
  due to tuberculous infection of the pelvic peritoneum, 404
  enterovaginal, 118, 119
  fecal, classified, 102
Fistulæ, fecal, congenital, 55
  following injury of the bladder, 145
  following operation for complete perineal laceration, 72
  following ovariotomy, 661
  in tuberculosis of the vulva, 388
  in tuberculous infection of the bladder, 405
  in tuberculous infection of the rectum, 407, 408
  in tuberculous infection of the vagina, 390
  rectovaginal, 114-118.
  tuberculous, rectal, 419
    treatment of, 431
  ureterovaginal, 113, 114
  urethrovaginal, 120, 121
  vaginal, 101-121
    due to tuberculous infection, 410
  vesicocervical, 103, 129-132.
  vesicouterine, 130
  vesicovaginal, 102-113
Flaischlen, 619, 636
Flap-sliding method, for rectovaginal fistula, 118
  for vesicovaginal fistula, Reed's, 110-112
Flap-splitting method for anterior rectocele, 186
  for complete laceration of the perineum, 94-98
  for incomplete lacerations of the perineum, 82-88
  for vesicovaginal fistula, Reed's, 108-110
Flaxseed, as a laxative, 776
Flexion of the uterus, 188. *See also* Uterus
Florence reaction for seminal stains, 61
Follicles of Skene, 317
Follicular cysts of the ovaries, 671, 672
  of the uterus, 669
Follicular ulcers, 362
Follicular urethritis, 317
Folliculitis, gonorrheal, 317
  of the vulva, 452, 453
    symptoms of, 453
    treatment of, 453, 454
Forceps, aneurysmal varix due to frequent application of, 692

Forceps, Bozeman's long dressing, 846
  dissecting, 844, 845
  Emmet curette, 274
  four-tined, 224
  hemostatic, 844
  Lawson Tait colpocystotomy, 274
  mouse-toothed, 825
  Péan's, for morcellement, 845
  Pryor traction, 575
  use of, in rupture of the uterus during labor, 730
  uterine dressing, 822
  vesicovaginal fistula and use of, 104
Forchheimer, 709
Foreign bodies, classes of, 271
  in the bladder, 276-278. *See also* Bladder
  in the kidneys, 285-288. *See also* Kidneys
  in the rectum, 290
  in the urachus, 289
  in the ureters, 279-284
  in the urethra, 140, 275
  in the uterus, 273, 274. *See also* Uterus
  in the vagina, 271, 272. *See also* Vagina
  in the vagina or rectum, rectovaginal fistula due to, 114
  injuries of the rectum due to, 168
  laceration of the vulva due to, 58
  vesicovaginal fistula due to, 104
Formaldehyd in treatment of erysipelas of the vulva and vagina, 380
Fornia, chancre parchemine of, 352
Fourchette, injuries to, 65
Fournier, 62
Fournier procedure for lacerated cervix, 129
"Fracture" of the kidney parenchyma or substance, 160, 165
Frank, 735
Fränkel, 391, 409, 637, 672
Fränkel's case of calculous anuria, 280, 281
Franqué, 391, 393, 400, 614, 627
French Lick Springs, for vesical calculi, 277
Frerichs, 401
Fresh air, in treatment of tuberculosis, 421
Freund, W. A., 489
Freund and Chadwick's case of echinococcus infection, 487
Friedlander, 390, 399
Friedlander's case of tuberculosis of the vagina, 389
Fritsch, 563, 744
Fritsch incision in Cesarean section, 746
Fritsch uterine irrigator, 469
Frommel, 438, 439, 636
Frorieps, 393
Fuller, 402
Fungous endometritis, 463
Furth, 627
Furuncles, differentiation of chancre from, 357
Fused kidney, 49, 50
Fusions of the clitoris, 2
  diagnosis of, 3
  procedure for, 3
Fütterer, 256

Galactocele, 688
Ganghoffer, 547
Gangrene, due to diphtheria bacillus, 433
  due to pudendal hematocele, 63
  emphysematous, due to septic vibrion, 442
Gant, 408, 430, 431, 665, 689, 695, 696
Gant's clamp, 699
Gardner, 653
Garrigues' modification of the Simon-Hegar procedure for lacerated perineum, 82
Gärtner's duct, 677
  development of cystomata of the vulva from, 666
Gas, intestinal, escape of, in rectovaginal fistula, 114
Gas-oxygen anesthesia, for examination for rudimentary ovaries, 35
Gastric symptoms in movable kidney, 256
Gastrocoloenteroptosis, displacements of the uterus due to, 193
  prolapsus of the uterus due to, 239
Gau speculum, 818, 819
Gauze drainage, 866, 870, 871
  following abdominal panhysterectomy, 526

Gauze pack, procedure for induction of abortion by, 712
Gaylord, 364
Gebhard, 616, 628, 638
Gehrung, 763
Geil, 393
Gelsemium, in treatment of dysmenorrhea, 790
Gemmell, 759
Gerota's capsule, 257, 258
Gersuny procedure for hypospadias, 38
Gessner, 466
Gigli procedure of pubiotomy (Döderlein), 735-737
Giglio, 442
Gilliam, 630
Gilliam procedure for ventral suspension of the uterus by the round ligaments, 220-222
  Barrett modification of, 222, 223
Girode, 435, 439
Glands of Bartholin, 299, 300
    gonococcus infection of, 300, 301
  of Naboth, origin of cysts of the uterus in, 669
Glandular hypertrophic endometritis, 463
  due to gonococcus infection of the uterus, 303
  in prolapse of the uterus, 198
Gleaves, 761
Glenard, 254
Glycerin as a solvent for intrauterine applications in metrorrhagia, 779
  use of, in kraurosis vulvæ, 705
    in vaginitis, 459
Glycerin tamponade, use of, in displacements of the uterus, 204
  in retrodisplacements of the uterus, 208
Glycosuria at the menopause, 801
  erythema of the vulva due to, 449
Godlio, 409
Goffe, 541
Goffe procedure for cure of cystocele, 176-179
  for shortening the round ligaments by the vaginal route, 225-227
Goffe's case of pseudo-hermaphroditism, 4, 5
Goldsphon's modification of the Alquié-Alexander procedure, 218
Gonococcus, cystitis due to, 473
  Gram method of demonstrating, 321, 322
  in mixed infection of the kidney, 474
  in tuberculous Fallopian tubes, 399
Gonococcus infection, latent form of, 321
    symptoms and diagnosis of, 329-331
  medical treatment of, 331-333
  of bladder, 317-319
    local and surgical treatment of, 350
    medical treatment of, 349, 350
    predisposing to tuberculous infection, 404
    symptoms and diagnosis of, 327, 328
  of the Fallopian tubes, 304-315
    mixed infection following, 470
    symptoms and diagnosis of, 323-326
  of the kidney, 319
    local treatment of, 351
    medical treatment of, 350, 351
    surgical treatment of, 351
    symptoms and diagnosis of, 328, 329
  of the ovaries, 315-317
    symptoms and diagnosis of, 326
  of the rectum, 319, 320
    symptoms and diagnosis of, 329
  of the urethra, 317-319
    local and surgical treatment of, 350
    medical treatment of, 349, 350
    symptoms and diagnosis of, 327
  of the uterus, 302-304
    steam in treatment of, 469
  of the vagina and cervix, cysts due to, 669
  of the vulva and vagina, 299
    symptoms and diagnosis of, 321, 322
  of the vulvovaginal gland, 299-301
    symptoms and diagnosis of, 322, 323
  organism of, 297-299
  prognosis of, 331

- Gonococcus infection,
  - surgical treatment of, 333, 334
    - procedure for evacuation of pus from the pelvis (vaginal route), 334-337
    - procedure for through-and-through drainage of pus from the pelvis by the extraperitoneal route, 338, 339
      - by the transperitoneal or abdominovaginal route, 339-342
    - salpingo-oöphorectomy, 342, 349
  - symptoms and diagnosis of, in general, 320, 321
  - vaginitis following, 458
- Gonorrhea, eczema of the vulva due to, 451
  - following indecent assault, 62
  - following rape, 60
  - herpes progenitalis and, 454, 455
  - intertrigo of the vulva due to, 447
  - latent, 298
    - procedure for examination in, 330
  - organism of, 297-299
  - patulous urachus due to, 44
  - relation of, to atrophy of the vulva, 704
- Gonorrheal cystitis, 317-319
  - treatment of, 349, 350
- Gonorrheal folliculitis, 317
- Gonorrheal urethritis, 317
- Goodell, 534, 628, 789
- Goodell dilator, 821
- Gossypium, in treatment of menorrhagia, 776
- Gottschalk, 641
- Goulliund, 49
- Goupil, 713
- Graafian follicle, cysts of, 671, 672
  - origin of ovarian cysts in, 635, 636
- Gram method of demonstrating the gonococcus, 321, 322
- Gränicher, 612
- Grant, 553
- Granular endometritis accompanying cervical stenosis, 233
- Grape, 616
- Grawitz, 620, 867
- Greig, 534
- Gross, 662
- von Guerard, 469, 470
- Guerin, 667
- Guillemain, 400
- Guiteras, 280, 285, 417, 429, 474, 477, 624
- Guiteras procedure for exploration of the kidney, 478, 479
  - for ruptured bladder, 145, 146
  - for transperitoneal ureterovesical implantation, 152, 153
- Guiteras' cases of foreign bodies in the bladder, 276
- Gummata of the breast, diagnosis of, 358
  - of the cervix, 354
  - of the external genitals, 354
  - of the Fallopian tubes, 355
  - of the pelvic lymphatics, 355
  - of the rectum, 358
  - pelvic, diagnosis of, 357
  - vulval, diagnosis of, 357
- "Gummatous oöphoritis," 355
- Gunning, 793
- Gunshot wounds of the bladder, 144
  - of the rectum, 168
  - of the uterus, 133
- Gurlt, 541
- Gusenthal, von Rogner, case of, of ovarian hernia, 248
- Gusserow, 547, 610, 678
- Guyon, 435

- H operation. *See* Tait procedure for complete laceration of the perineum by the flap-splitting method
- Haeckel, 611
- Hagner, T. R., 319, 351
- Hagner procedure for removal of carcinoma at the fundus of the bladder, 585, 586
- Hahn, 250
- Halban, 26
- Halbertsma, 425
- Hall (R. B.) procedure for extirpation of intraligamentary parovarian cysts by excision of the uterus and appendages, 683, 684
  - removal of myomata of the broad ligament by, 534
- Halle, 317, 472
- Halstead, 218

Halstead procedure for extirpation of the breast for carcinoma, 600-602
Hammarsten's test for pseudomucin, 633
Handfield-Jones, 785, 786
Hanks, 511
Harris, 63, 67, 251, 252, 253, 318, 419, 472, 498, 559
Harris urine segregator, 828
Harris' (M. L.) case of misplaced Fallopian tube, 30
Harris' case of movable kidney, 256
Hart, 17
Hartmann, 435
Hartmann procedure for obliteration of cul-de-sac of Douglas, 268, 270
Heape, Walter, 756, 766, 768
Heart, changes in, at the menopause, 800, 801
Heat, application of, following abdominal operations, 869
  in treatment of dysmenorrhea, 791
  in treatment of mastitis, 482
Heat flashes at the menopause, 800
  treatment of, 803
Hebra, 484
Hedonal, intravenous injection of, for anesthesia, 854, 855
Hegar, 390, 392, 394, 395, 399, 413, 414, 533, 535, 646, 671
Heiberg, 400, 641
Heimbs, 393
Heineke-Mikulicz operation, 46
Heinrichs, 551, 617
Heitzmann, 705
Hematocele, pudendal, 62
    symptoms and diagnosis of, 63
    treatment of, 63
Hematocolpos in atresia of the vagina, 18
  in double vagina, 15
  in imperforate hymen, 7
Hematogenous infection, 396
Hematomata of the corpus luteum, 673
  pelvic, differentiation of gonococcus infection of Fallopian tubes from, 325
Hematometra, 18, 26
Hematosalpinx, 18, 311, 312
Hematuria in carcinoma of the kidney, 559, 560
Hematuria in carcinoma of the urethra, 558, 559
  in distoma-hematobium infection, 486
  in foreign bodies in the bladder, 276, 277
  in renal calculus, 286
  in sarcoma of the bladder, 622
  in tuberculous infection of the bladder, 417
  in tuberculous infection of the kidney, 406, 418, 419
Hemisection of the uterus in chronic inversion, 754
  myomectomy by, 513-516
  procedure for supravaginal hysterectomy, without removal of the appendages by, 522-524
  Pryor procedure for vaginal hysterectomy by, 574, 575
Hemophilia, menorrhagia and, 772
Hemoptysis, as vicarious menstruation, 796
Hemorrhage. *See also* Menorrhagia and Metrorrhagia
  causing hematomata of the corpus luteum, 673
  control of, in enucleation of intraligamentary parovarian cysts, 683
  due to wounds of the uterus, 134
  following curettage of the bladder, 585
  following lacerations of the cervix uteri, 124
  following vaginal cystostomy, 585
  from the stomach, as vicarious menstruation, 796
  hematosalpinx due to, 312
  in adenoma malignum of the uterus, 629
  in atrophy of the uterus, 709
  in atrophy of the vagina, 707
  in carcinomata of the kidney, 560
  in carcinomata of the uterus, 556
    control of, 565, 567
  in chorioepitheliomata of the uterus, 537
  in diagnosis of rape, 60
  in ectopic pregnancy, 716
  in hemorrhoids, 696
  in injuries of the bladder, 145

Hilton, 422
Hippocrates' method of reducing an inverted uterus, 754
Hirsch, 754
Hirst procedure for cystocele, 180, 181
His, 536
Hislop's case of echinococcus infection, 488
Hodge pessary, use of, in pelvic varicocele and aneurysmal varix, 693
Hofbauer, 394
Hofmeier, 460
Holden, 691
Holmes' needle, 865
Horseshoe kidney, 50
Hot Springs, Arkansas, for vesical calculi, 277
Howie, 760
Huguier, 353, 667
Hunter's case of uterine myoma, 493
Hüter's case of misplaced Fallopian tube, 30
Hyalin degeneration in endothelioma of the ovary, 619
  in sarcoma of the uterus, 616
Hydatid cyst, of the breast, 688
  of the ovum, abortion indicated in, 710
Hydatid moles, due to echinococcus infection, 487
Hydatids, differentiation of ovarian tumors from, 649, 650
  of Morgagni, 677
Hydatidiform mole, chorioepitheliomata of the uterus and, 537
Hyde, 354
Hydremia, treatment of menorrhagia in, 774, 775
Hydrocele of the round ligament, 684
  treatment of, 684
    Volbrecht procedure for, 685
Hydrocephalus, rupture of the uterus during labor due to, 728
Hydronephrosis, 255
  differentiation of myomata of the kidney from, 504
  differentiation of ovarian cysts from, 649
  due to vaginal sarcoma, 613
Hydrops folliculi, 671
Hydrops folliculorum ovarii, accompanying prolapse of the uterus, 198, 200
Hydrops tubæ profluens, 310
Hydrops tubarum. *See* Hydrosalpinx
  accompanying prolapse of the uterus, 200
Hydrosalpinx, 308-310
  accompanying uterine myomata, 502
  defective development of Fallopian tube predisposing to, 28
  diagnosis of, 326
  types of, 310, 311
Hydrosalpinx pseudofollicularis, 310
Hydroureter, 46, 255
Hymen, anatomical structure of, 5
  atypical, 5
    symptoms of, 5
    treatment of, 5
  cysts on, 666
  imperforate, 7
    procedure for, 8
    symptoms and diagnosis of, 7, 8
  laceration of, in rape, 59, 60
  types of, 59
Hymen biformis, 15
Hypercatharsis preceding abdominal operation contraindicated, 842, 843
Hyperemia in progressive cutaneous atrophy of the vulva, 704
Hyperesthesia, sexual, a symptom of fusion of the clitoris, 3
Hyperinvolution of the uterus following delivery, 708
Hypernephroma, 620, 621
  differentiation of myomata of the kidney from, 504
  treatment of, 624
Hyperplasia, due to gonococcus infection of the uterus, 302
  of the connective tissue in gonococcus infection of the Fallopian tubes, 306
  of the endometrium, following cervical lacerations, 124
  of the parenchyma of the cervix, following cervical lacerations, 123, 124
  uterine, in anteversion of the uterus, 196

Hyperplasia, uterine, in retrodisplacement of the uterus, 194
Hypertrophy, glandular, following healing of cervical lacerations, 123, 124
    differentiation of uterine carcinoma from, 545
    of uterine mucous membrane, 628
  of the cervical canal due to laceration, 122
  of the clitoris, 4
  of the connective tissue in gonococcus infection of the Fallopian tubes, 306
  of the convex wall of a retroflexed uterus, 195
  of the endometrium, following cervical lacerations, 124
  of the follicle, 671
  of the kidney in single kidney, 48
  of the muscularis, in gonococcus infection of the bladder, 319
  of the parenchyma, following cervical lacerations, 124
  of the uterine wall, in anteflexion of the uterus, 196
    in flexion of the uterus, 230
  of the uterus, due to myomata, 497
    in ectopic pregnancy, 716, 717
  of the vagina and uterus, in imperforate hymen, 7, 8
  of the vulva, due to filaria sanguinis hominis infection, 486, 487
Hypochondria at the menopause, 801
Hypodermoclysis, in wounds of the uterus, 135
  procedure for, 841
Hypospadias, 4, 37
  symptoms and diagnosis of, 38
  treatment of, 38
    Gersuny procedure for, 38
Hysterectomy, 508
  abdominal, in two-horned uterus, 26
  complete, 508, 509
  enterovaginal fistula due to, 118
  Faure-Kelly operation for, 523
  following wounds of the uterus, 135
  in adenomyomata of the uterus, 627
  in arteriosclerosis of the uterus, 709
  in chorioepitheliomata of the uterus, 537, 538
Hysterectomy, in echinococcus infection, 489
  in puerperal infection, 383
  in rupture of the uterus during labor, 730
  in tuberculous infection of the uterus, 424, 426
  injury of ureter during, 148
  partial supravaginal, Schroeder procedure for, 518, 520, 522
  supravaginal, 508
    by hemisection of the uterus, without removal of the appendages, procedure for, 522-524
    including removal of the appendages, procedure for, 516-520
  vaginal, by hemisection of the uterus, Pryor procedure for, 574, 575
    for carcinoma of the uterus, Newman procedure for, 572-574
    in carcinoma of the uterus complicated by pregnancy, 547
    in inversion of the uterus, 755
  vesicovaginal fistula following, 103, 104
Hysteria at the menopause, 801
  due to cervical lacerations, 125
Hysteroscope, 820
  Duke, 820
Hysterovaginectomy, abdominal, procedure for, 562, 563
  vaginal, 563

Ice-bag, use of, in mastitis, 482
  in pudendal hematocele, 63
Ice pack in the anus, following removal of hemorrhoids by ligature and cautery, 698
Ichthyol, in glycerin, in treatment of erysipelas of the vulva and vagina, 381
  use of, in eczema of the vulva, 451, 452
    in folliculitis of the vulva, 454
    in treatment of intermenstrual pain, 794
    in treatment of vaginitis, 459
Ichthyol liniment for eczema of the vulva, formula for, 452
Ichthyol pack, in puerperal infection, 382, 383

Ichthyosis, kraurosis vulvæ differentiated from, 705
Ignohysterectomy, Byrne procedure for, 569-572
Iliococcygeus muscle, 66
Ill's method of intrauterine irrigation, 383
Imperforate half vagina, 15
Imperforate hymen, 7, 8
Imperforate vagina. *See* Atresia of the vagina
Implantation, ureterointestinal, 148
    procedure for, 156, 157
    Reed procedure for, 155
  ureterovesical, 148
    Guiteras procedure for, 152, 153
    in ureterovaginal fistula, 114
    Sampson procedure for, 153, 154
    Van Hook procedure for, 154, 155
Implantation metastasis, 637
Incontinence of feces in carcinoma of the rectum, 560
    in injuries of the rectum, 168
    in perineal lacerations, 70
    in rectovaginal fistula, 114
  of urine, due to injuries of the bladder, 145
    due to overdilatation of cystic orifice of the urethra, Stark procedure for, 143
    following curettage of the bladder, 585
    following injury of the urethra, 140
    in atypical hymen, 6
    in cystocele, 175
    in duplication of the ureters, 46
    in epispadias, 39
    in hypospadias, 38
    in parovarian cysts, 681
    in ureterovaginal fistula, 113
    in vesicocervical fistula, 129
    in vesicovaginal fistula, 104
Incrusted chancre, 353
Indecent assault, lacerations of the vulva due to, 62
    symptoms and diagnosis of, 62
Indurated nodule, 353
Infantile uterus, 23, 24. *See also* Uterus
Infantile vulva, 3
Infantilism due to rudimentary ovaries, 35
Infections of the genitourinary tract in general, 291
  classification of, 294-296
Infiltrating carcinoma of the kidney, 553
Infusion, intravenous, of normal salt solution or the saline (Fischer's) solution, 840, 841
Inguinal hernia, 218, 247
Inguinal incision, 858
Inhaler, Allis ether, 849
  Esmarch's chloroform, 849
Injuries of the bladder, 144-147. *See also* Bladder
  of the Fallopian tubes, 136-138
  of the kidneys, 158-167
  of the ovaries, 139
  of the rectum, 168-170. *See also* Rectum
  of the ureter, 148-157
  of the urethra, 140-143. *See also* Urethra
  of the uterus, 122-135
  of the vulva, 58-63
Insanity at the menopause, 801
Insomnia, treatment of, at the menopause, 803
    in tuberculous infection of the bladder, 429
Inspection, examination by, 811, 812
Instrumentation, mixed infections of the bladder due to, 472
  uterine infection due to, 463
Instruments for general abdominal operations, 843-847
  for ovariotomy, 653
Intermenstrual pain, 324, 793, 794
  treatment of, 794
Interrupted suture, procedure for closure of abdominal incision by, 864, 865
Interstitial fibromyomata of the uterus, 494
Interstitial pregnancy, 714
  rupture of the uterus due to, 727
Intertrigo of the vulva, 446-448
  diagnosis of, 448
  eczema of the vulva due to, 451
  treatment of, 448, 449

Intestinal indigestion associated with movable kidney, 257
Intestines, displacement of, 267
  aneurysmal varix due to, 693
  displacement of the uterus due to, 192
  treatment of, 267, 268
    Hartmann procedure for the obliteration of the cul-de-sac of Douglas, 268, 270
    procedure for obliteration of the cul-de-sac of Douglas, 268, 269
  involvement of, in displacement of the ovaries, 247, 248
  myomata of, 500
  tuberculosis of, 407, 408
Intraligamentary parovarian cysts, procedure for extirpation of, by enucleation, 682, 683
  procedure for extirpation of, by excision of the uterus and appendages, 683, 684
Intraligamentous fibromyomata, 495
Intraligamentous pregnancy, 715
Intravenous infusion of normal salt solution or the saline (Fischer's) solution, 840, 841
Intravenous injection of chloroform, 855
  of ether, 855
  of hedonal, for anesthesia, 854, 855
  of isoprol, 855
Invagination due to adenomata of the rectum, 665
Inversion of the uterus, 749-755. *See also* Uterus, inversion of
Involution, cervical lacerations and, 124
  of uterine and ovarian vessels, arrested, causing varicocele and aneurysmal varix, 692
Involutional atrophy of the vulva, 701
Iodids, use of, in diffuse syphilitic mastitis, 360
Iodin, in treatment of intermenstrual pain, 794
  in treatment of metrorrhagia, 779
  use of, following Cesarean section, 745
Iodoform in treatment of chancroids, 364
  in treatment of endometritis, 468
Iodonucleod, in arteriosclerosis of the uterus, 709
Irion, 760
Iron in treatment of anemia, 775
  in treatment of anemia causing amenorrhea, 782
  in treatment of infantile uterus, 24
Iron perchlorid, use of, in palliative treatment of uterine carcinoma, 565
Irrigation, antiseptic, following perineal operations, 100
  cold water, in treatment of hemorrhoids, 696
  continuous, arrangement of mattresses for, 871
  continuous intrauterine, in puerperal infection, 382, 383
  following sigmoidostomy for inoperable cancer of the rectum, 599
  hot water, in pelvic varicocele and aneurysmal varix, 693
  in carcinoma of the breast, 608
  in carcinoma of the rectum, 597
  intrauterine, Ill's method of, 383
  of the abdominal cavity, in wounds of the uterus, 135
  of the bladder, following operation for vesicovaginal fistula, 113
    in gonorrheal cystitis, 350
    in tuberculous infection, 429
  of the peritoneum, in operation for ruptured bladder, 147
  of the vagina, following operation for vesicovaginal fistula, 113
    in eczema of the vulva, 451
Irrigator, Fritsch uterine, 469
Ischiococcygeus muscle, 66
Isoprol, intravenous injection of, 855
Israel, 559
Israel procedure (transperitoneal), for exposing the kidney, 163, 164
Isthmic tubal pregnancy, 714
Itching, in streptococcus infection of the vulva and vagina, 376

Jackson (Jabez N.) procedure for extirpation of the breast for carcinoma, 606, 607
Jacobs, 400, 469
Jahr, 282

Jani, 392, 395, 400
Janni, 692
Jans, 396, 402
Jaundice, menorrhagia due to, 773
Jellinghaus, 727
Jevonsky, 704
Johnson, Taber, procedure for ovariotomy after, 654-659
Johnston, Wyatt, summary by, of physical evidences of rape, 58
Jones, 750
Jones, George E., 615
Jones, Herbert C., 781
Jones, Macnaughton, 537

Kahlden, 616
Kaltenbach, 533
Kalustow, 614
Karajan, 387, 388
Karlsbad, springs of, for vesical calculi, 277
Katz, 415
Kaufmann, 393, 409
Kehrer, 370, 371
Kehrer procedure for reduction of chronic inversion of the uterus, 753, 754
Keith, 533, 652
Kelly, 133, 153, 387, 393, 402, 403, 414, 415, 423, 425, 511, 516, 518, 533, 637, 649, 677, 678
Kelly conical urethral dilator, 823, 824
Kelly cystic speculum, 823, 824, 825
Kelly procedure for catheterization of the ureters, 826, 827
  for complete laceration of the perineum, 93, 94
  for exposing the kidney, 162
  for extirpation of the kidney and ureter (nephroureterectomy) for carcinoma, 591
  for reëstablishment of the urethra, 141
  for ventral suspension of the retrodisplaced uterus, 213-215
Kelly's case of a catheter as a foreign body in the bladder, 276
  of hypospadias, 38
Kelly and Cullen's case of ovarian myoma, 499
Kerley, 796
Kidneys, absence of one or both, 48
  absence of one, accompanying absence of one Fallopian tube, 27
    accompanying absence of one ovary, 34
  adenocystoma of, 553
  adenomata of, 664
  adenomatous carcinoma of, 553
  angiosarcoma of, 620
  anomalies in number of, 48, 49
  anomalies of form of, 49, 50
  anomalies of location of, 49
  calculus in, 285-288. *See also* Calculus, renal
  carcinomata of, pathology of, 553
    symptoms and diagnosis of, 559, 560
    treatment of, 591
      Kelly procedure for nephroureterectomy, 591
  condition of, preceding operation, 842
  contusions of, 158
    symptoms and diagnosis of, 158, 159
    treatment of, 159
  cystomata of, 685-687
    symptoms and diagnosis of, 687
    treatment of, 687
  displacements of, anatomical considerations of, 250
    classification of, 254, 255
    etiology of, 251-254
    mechanical treatment of, 258
    medical treatment of, 257, 258
    occurrence of, 251
    surgical treatment of, 258, 259
      Edebohls' procedure of fixation of the kidney by decapsulation, 262, 263
      Longyear procedure for anchorage of displaced kidney, 260-262
      procedure for extracapsular fixation of the displaced kidney, 259, 260
    symptoms and diagnosis of, 255-257
  effect of ovarian tumor on, 647
  examination of, by catheterization, 826, 827
  foreign bodies in, 285

Küstner procedure for instrumentodigital reposition of the uterus, 204, 207, 208
  for reposition of the retrodisplaced uterus, 204, 205, 206
Küstner's case of vaginal carcinoma, 541
Küstner's statistics on movable and ruptured kidney, 252, 253

Labadie-Lagrave, 375
Labert, 390
Labor, chorioepitheliomata of the uterus following, 535, 537
  complicated by septate uterus, 24
  complicated in two-horned uterus, 26
  cystitis due to trauma following, 471
  hematosalpinx following injuries due to, 312
  lacerations of the cervix uteri and, 124, 125
  lacerations of the perineum following, 64-100
  pudendal hematocele and, 62, 63
  rectovaginal fistula following, 114
  rupture of the uterus during, 728-732
  spurious, 722
  vesicocervical fistula and, 129
  vesicovaginal fistula following, 104
Lacerations of the cervix uteri, 122-129. *See also* Cervix uteri
  of the perineum, 64-100. *See also* Perineum
  of the perineum and cervix, treatment of, at the menopause, 802
  of the vulva, 58-62. *See also* Vulva
Lactation mastitis, 481
Laminated suture, procedure for closure of abdominal incision by, 862-864
Landau, 254, 310, 399, 626
Lange procedure for prolapsus of the rectum, 266
Langhans, 716
Laparosalpingotomy, performance of, in 1784, 343
Laser, 298
Lassar's formula for application in erythema of the vulva, 450
Lassar's paste, formula for, 454
Lassar's paste, use of, in treatment of folliculitis of the vulva, 454
Latent gonorrhea, procedure for examination in, 330
Lateroprone position. *See* Sims position
Lauenstein procedure for complete laceration of the perineum, 92, 93
Lavage of the bladder in gonorrheal cystitis, 350
  of the kidney, by urethral catheterization, in mixed infection, 477
    in gonococcus infection, 351
  of the stomach, postoperative, 872
    procedure for, under anesthesia, 868, 869
Lead and opium, in treatment of herpes progenitalis, 456
Lebedeff, 617
Left lateral prone position, 809
Leguen, 255
Leick, 433
Leiomyoma, 500
Leishman, 737
Lejars, 687
  use of interrupted suture by, in hemostasis of ruptured kidney, 167
Lejars' procedure for exposing the kidney, 163-164
Lembert, 730
Lennhoff, Becker and, index of, 252
Leopold, 461, 618, 619, 620, 652, 690, 708, 727, 737, 743, 744, 746, 768, 769, 779
Lepine, 355
Lermoyez, 796
Letulle's case of a penholder in the bladder, 276
Leukoplakia in carcinomata of the vulva, 540
Leukorrhea, due to cysts of the uterus, 669
  eczema of the vulva due to, 451
  in atrophy of the vagina, 707
  in progressive cutaneous atrophy of the vulva, 703
  in tuberculosis of the cervix uteri, 409
  in tuberculous infection of the vagina, 410

Malformations of the Fallopian tubes, 27-32
  of the kidneys, 48-50
  of the ovaries, 33-36
  of the rectum, 51-55
  of the ureters, 46, 47
  of the urethra, 37-39
  of the uterus, 20-26
  of the vagina, 6-19
  of the vulva, 1-5
Malignant degeneration of ovarian cysts, 644, 645
Malignant placentoma, 535
Malins, 691, 692, 693
Malpresentation due to septate uterus, 24
  due to two-horned uterus, 26
Mammary glands, absence and rudimentary development of, 56
    symptoms and diagnosis of, 56
    treatment of, 56
Mann, 216, 217, 628
Mann procedure for Cesarean section, 743-746
  for intraabdominal shortening of the round ligaments, 223-225
Manton, 781
Manual examination of the kidney, procedure for, 257
Marchand, 536, 618, 636
Marriage, carcinoma of the uterus and, 543
    improvement following, in infantile vulva, 3
  in cases of infantile uterus, 23, 24
  rudimentary ovaries and, 36
Marshall, Balfour, 612
Marsupialization, 726
Martin, 308, 312, 399, 412, 413, 414, 469, 533, 547, 548, 563, 652, 670, 705, 866
Martin Christopher, 764, 798
Martin anoscope, 832, 833
Martin procedure for complete laceration of the perineum, 90-92
  for incomplete laceration of the perineum, 78-81
  of instrumental proctoscopy, 832-837
  of non-instrumental proctoscopy, 830-832
Martin proctoscope, 832, 833
Mascagni, 395, 396
Massage in prolapsus of the uterus, 237
  in treatment of tuberculosis, 422
  of the uterus, for relief of cervical stenosis, 233
Massen, 29
Massey, 784
Massin, 464
Mastitis, 481
  diagnosis of, 481, 482
  diffuse syphilitic, 358
    treatment of, 360
  interstitial syphilitic, 355
  treatment of, 482, 483
  tuberculous, pathology of, 408
Masturbation, 62
  a symptom of fusion of the clitoris, 3
  foreign bodies in the bladder for purposes of, 276
  injuries of urethra due to, 140
Matthews, 699
Maydl procedure for transplanting the ureters in extroversion of the bladder, 42, 43
Mayer, 396, 614
Maylard, 386, 392, 426
Mayo (C. H.) procedure for extirpation of the rectum by the abdominoperineal route, 595, 596
  for transperitoneal cystostomy, 587-590
Mayo (W. J.) procedure for extirpation of the rectum for carcinoma, 593
Mayo's blunt dissectors, 605
Mayo-Robson procedure for exposing the kidney, 162, 163, 164
  for high rectovaginal fistula, 115, 116
  for low rectovaginal fistula, 116-118
McDowell, Ephraim, ovariotomy first performed by, 651, 652
McFarland, 616
McKay, 96
  Tait procedure for lacerated perineum illustrated by, 86
McLaury, 761
McMurtry, 462, 503, 510, 719, 721, 723
McMurtry procedure for immediate intervention in ruptured ectopic pregnancy, 723, 724

McMurrick, 50
McRae, 144
  records of, of gunshot wounds of the rectum, 168
Meadows, Alfred, 713
Median abdominal incision, procedure for making, 859-862
  vertical, 856
Medullary carcinomata of the breast, 555
  of the kidney, 553
  of the uterus, 549
Melancholia at the menopause, 801
Melanocarcinoma of the vulva, 612
Melanosarcoma of the vulva, 611, 612
Melchoir, 317, 318, 472, 473
Membranous dysmenorrhea, 461, 791-793
  symptoms of, 792
  treatment of, 792, 793
Mencière's cases of displaced ovary, 249
  of hernia of the ovary, 247
Menge, 304, 309, 395, 412, 440
  on normal bacteriology of the Fallopian tubes, 294
Menges, 390
Menopause, 798-802
  atrophy of the uterus at, 708
  atrophy of the vagina following, 707
  atrophy of the vulva at, 701
  cause of, 798
  changes in the heart at, 800, 801
  changes in the ovaries at, 799
  changes in the uterus at, 799
  cysts of the cervix accompanying, 699
  induction of, in menorrhagia, 777
  treatment of perturbations of, 802-804
Menorrhagia, 772
  causes of, 772
    general systemic, 772
    local diseases above the pelvis, 773
    pelvic, 773, 774
  in atrophy of the uterus, 709
  in progressive cutaneous atrophy of the vulva, 703
  treatment of, 774-777
Menorrhalgia, 784
Menses. *See* Menstruation
  retention of, 783
Menstrual cycle, 761, 762
Menstrual cycle, stages of, 76
Menstrual fluid, accumulation o
    perforate hymen, 7, 8
  character of 763, 764
Menstruation, bi-monthly, in
    uterus, 24
    in two-horned uterus, 26
  cessation of, in ectopic pr
    718, 720, 721
  character of discharge in, 76
  disturbances of, in ovarian
    646, 648
    in tuberculous infection of
    vic peritoneum, 414
  duration of, 762
  effect of, on bladder, 471
    on the endometrium, 461
  fibroadenomata of the bre
    662
  following partial resection
    ovaries, 676
  hygienic management of, 77
  in animals, 756, 757. *See a*
    ting
  in echinococcus infection, 48
  in inversion of the uterus, 7
  in pelvic varicocele and an
    varix, 693
  in savages, 757, 758
  inducing cause of, 764, 765
  influence of, on disease pro
    the uterus, 425
    on movable kidney, 256
  irregular, in double uterus,
  menstrual cycle, 761
    stages of, 766, 767
  normal, 756-770
  painful. *See* Dysmenorrhea
  period of appearance of, 759-
  precocious, 759-761
  profuse and painful, in tub
    infection of the Fallopia
    412
  profuse and prolonged, in
    myomata, 502
  quantity of discharge in, 76
  recurrence of, in ectopic pr
    718, 720
  relation of, to cystomata of
    ovarium, 681
    to ovarian cysts, 631

Menstruation, rôle of the Fallopian tubes in, 767, 768
  rôle of the ovaries in, 768-770
  rôle of the uterus in, 766, 767
  rutting and, 757-759
  suppression of, by intrauterine injections of hot or iced water, 764
  theories of, 764, 765
  vicarious, 795-797
  white, 763
Mental changes at the menopause, 801, 802
  treatment of, 803, 804
Mercurial ointment, in treatment of pediculosis pubis, 485
Mercuric bichlorid, use of, in syphilis, 359
  in late syphilitic ulcer of the vulva, 360
Mercury, use of, in diffuse syphilitic mastitis, 360
  in treatment of intermenstrual pain, 794
Mesentery, cysts of, differentiated from ovarian cysts, 649
Mesonephron, formation of, 254, 255
Metastases from carcinomata of the bladder, 552
  from carcinomata of the kidneys, 553
  from carcinomata of the ovaries, 550, 551
  from carcinomata of the uterus, 548
  from carcinomata and sarcomata of the vulva, 612
  from chorioepitheliomata of the uterus, 537
  from ovarian cysts, 637
  from sarcomata in general, 610
  from sarcomata of the ovaries, 618
  from sarcomata of the uterus, 612, 615
  from vaginal sarcomata, 613
Methylene blue, test for vesicocervical fistula, 129
  for vesicovaginal fistula, 104, 105
Metritis. *See* Uterus, mixed infection of
  chronic corporeal, menorrhagia due to, 774
Metritis, displacements of the uterus due to, 192, 195
  dysmenorrhea due to, 786
  interstitial suppurative, 369
  parenchymatous, atrophy of the uterus in, 708
Metrorrhagia, 778, 779
  in atrophy of the uterus, 709
  in pelvic varicocele and aneurysmal varix, 693
  in retrodisplacement of the uterus, 194
  menopause and, 800
  treatment of, 779
Meyer, 425
v. Meyer, 627
Mickulicz gauze drain, 340
Micrococcus gonorrhœæ, 297-299
Midpain, 24
Mikulicz's case of myoma of the broad ligament, 501
Miliary tubercles in the bladder, 405
  in the Fallopian tubes, 394, 397, 398, 399
  in the ovaries, 401, 414
  in the pelvic peritoneum, 402, 403
  in tuberculosis of the cervix uteri, 391, 393
  in tuberculous infection of the vagina, 389
Miller's speculum, 818
Millikin, Dan, 756
Mills, normal position of uterus determined by, 189
Miner, 533
Mineral waters, use of, in erythema of the vulva, 450
Minor, 658
Misplacement of the Fallopian tubes, congenital, 30-32. *See also* Fallopian tubes
  of the kidneys, 49
  of the ovaries, 33, 34. *See also* Ovaries
Mitchell, Hubbard Winslow, 780
Mittelschmerz, 24
Mittermaier, 274
Mixed infection of the bladder, 471-474, 476
  of the breast, 481-483. *See also* Breast
  of the Fallopian tube, 470

Mixed infection of the genitourinary organs, 443
    bacteriology of, 443-446
  of the ovaries, 470
  of the vulva, 446-457. *See also* Vulva
''Mole'' pregnancy, relation of chorioepitheliomata of the uterus to, 537
Molluscum pendulum of the vulva, 492
Monari procedure for lateral anastomosis of the ureters, 155
Monstrosities, rupture of uterus during labor due to, 728
Montecatini, springs of, for vesical calculi, 277
Montgomery, 653
Monti, 368
Monyhan, 855, 864
Morax, 435, 436, 440
Morcellement, Emmet procedure for, 529, 531
  in rupture of the uterus, 730
  of myomata of the broad ligament, 533
  Péan forceps for, 845
  Péan procedure for, 530, 531
  technique of, 528
Morgagni, 343
Moriasini, 734
Morphin in treatment of carcinoma of the vagina, 564
  in treatment of dysmenorrhea, 790
  postoperative use of, 869
  use of, after ovariotomy, 660
    in anesthesia with hedonal, 854, 855
    in nitrous-oxid-oxygen anesthesia, 852, 853
    in ureteral calculus, 282
Morris, 150, 415, 553, 685, 686, 687
Morris procedure for exposing the kidney, 163
  for extraperitoneal exposure of the ureter by the lumbo-ilio-inguinal route, 149, 150
Morse, 760
Morton's case of urethral calculus, 275
Mosler, 396, 400, 402
Mouse-toothed forceps, 825
Movable kidney. *See* Kidney, displacements of
Movable kidney, differentiation of, from mixed infection, 476
Mucous patches, 356
  differentiation of chancroid from, 363
  in the bladder, 355
  on the nipples, 355, 358
  treatment of, 359
Müller, 563, 611
Multiple laceration of the cervix, 122
Mummification of the fetus in ectopic pregnancy, 716, 722
Munde, 469, 501, 653, 793
Münster, 399
Muret's case of double vagina, 15
Murphy (J. B.) procedure for resection of the rectum by the vaginal route, 593-595
Muscatello, 866
Muscular layer, deep, injuries involving, 66, 67
  superficial, injuries involving, 65
Mustard seed, as a laxative, 776
Myer, 606
Myochondroma of the uterus, 498
Myomata, causing varicose veins of the vulva, 691
  of the bladder, 559
  of the broad ligament, pathology of, 500, 501
    symptoms and diagnosis of, 504
    treatment of, 533, 534
  of the cervix uteri, 527
  of the kidney, pathology of, 499
    symptoms and diagnosis of, 504
    treatment of, 532
  of the ovaries, pathology of, 499
    procedure for removal of, 532
  of the rectum and intestine, pathology of, 500
  of the uterus, Cesarean section indicated in, 738
    conservative surgical treatment of, 507
      procedure for ligating the uterine arteries by the vaginal route, 507, 508
      procedure for ligating the uterine and ovarian arteries by the abdominal route, 508
    evolution of types of, 496

Myomata of the uterus, interstitial, 494
  palliative treatment of, 505-507
    procedure for arrest of hemorrhage, 505, 506
  pathology of, 493-499
  radical treatment of, 508-511
    Emmet procedure of morcellement, 529
    indications for, 509
    Péan procedure of morcellement, 530, 531
    procedure for abdominal panhysterectomy, 524-527
    procedure for extirpation of cervical polypi, 531
    procedure for extirpation of larger polypi by écraseur, 531, 532
    procedure for myomectomy, 511-513
    procedure for myomectomy by hemisection of the uterus, 513-516
    procedure for supravaginal hysterectomy by hemisection of the uterus without removal of the appendages, 522-524
    procedure for supravaginal hysterectomy including removal of the appendages, 516-520
    procedure for vaginal extirpation of submucous myomata, 527-529
    procedure for vaginal myomectomy for tumors of the cervix, 527
    Schroeder procedure for partial (supravaginal) hysterectomy, 520-522
  steam in treatment of, 469
  submucous, 493, 494
  subserous, 494, 495
  symptoms and diagnosis of, 502-504
 of the vagina, pathology of, 492, 493
  symptoms and diagnosis of, 501, 502
  treatment of, procedure for, 505
 of the vulva, pathology of, 491, 492
  symptoms and diagnosis of, 501
  treatment of, 504
Myomata of the vulva, treatment of, procedure for, 505
Myomectomy, 508
  by hemisection of the uterus, procedure for, 513-516
  procedure for, 513-515
  vaginal, for submucous myomata, 527-529
    for tumors of the cervix, procedure for, 527
Myometrium, structure of, 461
Myoösteoma of the uterus, 498
Myxomata of the bladder, 551, 552
Myxomatous degeneration in endothelioma of the ovary, 619
  in sarcoma of the ovaries, 618
Myxosarcoma of the vagina, 613
  of the vulva, 611

Naegeli, 737, 769
Nagel, 672
Napier, 765, 798
Nausea, in ectopic pregnancy, 718, 720
Necrosis, fistula due to, in injuries of bladder, 145
  in sarcomata of the vagina, 613
  injuries of the bladder due to, 144
  of the ovary, 139
Needle, full curved aneurysm, 846
  Reed's obliquely curved, 846
Needle holders, 845
Neibergal, 546, 557
Nephrectomy for polycystic kidney, 687
  in gonococcus infection of the kidney, 351
  in tuberculous infection of the kidney, 430
  in ureterovaginal fistulæ, 113
  procedure for, 165, 166
Nephritis. *See* Kidney, mixed infection of
  chronic, menorrhagia due to, 772, 775
Nephrocolic ligament, 250, 251
Nephrocystosis due to stricture of the ureter, 46
Nephrolithiasis. *See* Calculi, renal
Nephroptosis. *See* Kidney, displacements of
  Israel procedure for exposing kidney in, 163

Nephropyosis, tuberculous, 406
Nephrostomy for renal calculi, 288
  in gonococcus infection of the kidney, 351
  in sarcoma, 625
  in ureteral calculus in children, 279
  Reed procedure for, 479, 480
Nephroureterectomy, 591
Nephrydrosis, due to duplication of the ureters, 46
  in single kidney, 48
Netter, 444
Neuendorff, 319
Neugebauer, 666
Neugebauer's cases of neglected pessaries, 273
Neugebauer's method of reducing uterine inversion, 754, 755
Neurasthenia, dysmenorrhea in, 784
  movable kidney and, 256
Neuroses of the menopause, 801, 802
    treatment of, 803, 804
Nevus, vicarious menstruation from, 796
Newman, 250
Newman knife, 127
Newman procedure of vaginal hysterectomy for carcinoma of the uterus, 572-574
Newman reverse-acting, self-locking, volsella, 847
Nicolich's case of ureteral calculus, 280
Nidus perinei, 65, 66
Nietert's case of gunshot wound of the uterus, 133
Nipples, chancre of, diagnosis of, 357, 358
  mucous patches on, 355, 358
  spirochæta pallida infection of, 355
    diagnosis of, 357, 358
Nitrate of mercury, in treatment of mucous patches, 359
Nitrate of silver, in treatment of herpes progenitalis, 456
  in treatment of kraurosis vulvæ, 705
Nitrate of silver solution in tuberculosis of the bladder, 429
Nitric acid in treatment of mucous patches, 359
Nitrites in treatment of menorrhagia, 777
Nitroglycerin, postoperative use of, 869
Nitrous-oxid-oxygen anesthesia, 851-854
Nitze, 649
Nitze operating cystoscope for sarcoma of the bladder, 623
Nitze procedure for catheterization of the ureters, 827
  for expulsion of the ureteral calculus, 282
Nitze-Otis cystoscope, 823
  procedure for examination of the bladder by, 825, 826
Noble, G. H., 546, 557, 575
Nodular carcinoma of the kidney, 553
Nodule, indurated, 353
Noeggerath, 298
Noma due to diphtheria bacillus, 433
Norton, 796
Nose, vicarious menstruation from, 795, 796
Nott trivalve speculum, 818, 819
Novocain anesthesia, 850

Oatmeal as a laxative, 776
Oblique subcostal incision, 858
Oblique ventral incision, 857, 858
Obstruction in carcinoma of the rectum, 560
    treatment of, 598, 599
  of the bowels following ovariotomy, 661
Obturator, use of, following operation for absence of vagina, 11, 12
  following operation for atresic vulva, 2
  following operation for stenosis of the rectum, 53
  following operation for stenosis of the vagina, 17
Ohmann-Dumesnil, 705
Oidium albicans infection of the genitourinary organs, 434
Oleate of mercury, in treatment of pediculosis pubis, 485
Oliver, 628
Olshausen, 501, 533, 548, 563, 580, 619, 638, 653, 671, 677, 678, 680, 681, 704
Omentum, involvement of, in displacement of the ovaries, 247, 248

One-horned uterus, 25. *See also* Uterus
Oöphorectomy for cystomata, procedure for, 675
Oöphoritis, chronic, coexisting with cysts of the corpus luteum, 673
  dysmenorrhea due to, 787
  parenchymatous, 315
Oöphoritis corticalis, accompanying prolapse of the uterus, 198
Open-air treatment of tuberculosis, 421, 422
Operating room, 847, 848
Operating table, 847, 848
Opiates in after-treatment of perineal operations, 98, 100
Opium, alcoholic extract of, postoperative use of, 869
  contraindicated after ovariotomy, 660
  lead and, in treatment of herpes progenitalis, 456
  use of, in carcinoma of the breast, 608
    in carcinoma of the rectum, 597
    in hemorrhoids, 696
Oppenheim, 389
Orthmann, 399, 548, 672, 704, 705
Osler, 402, 413, 416, 489
Ostia, accessory, of Fallopian tubes, 28-30. *See also* Fallopian tubes
Otroschkevitch, 799
Ott, 617, 764
Otterbridge dilator, use of, following divulsion and curettage of the uterus, 234
Outerbridge dilator, use of, following topical treatment of endometritis, 468
Ovarian cysts, differentiation of tuberculosis of the pelvic peritoneum from, 416
Ovarian tumors. *See* Ovaries
  differentiation of gonococcus infection of the Fallopian tubes from, 325
Ovarian varicocele. *See* Pelvic varicocele
Ovaries, absence of, 34
    symptoms and diagnosis of, 34
    treatment of, 34
  absence of one, accompanying single kidney, 48
  adenocarcinoma of, 549, 550
Ovaries, adenomata of:
    cystadenomata, 630-637
    embryomata, 638-640
  anatomy of, 246
  angiosarcoma of, 618
  bacillus coli infection of, 426, 435
  carcinomata of, pathology of, 548-551
    symptoms and diagnosis of, 558
    treatment of, 582
  changes in, at the menopause, 799
  congenital displacement of, accompanying rudimentary, 35
  congenital misplacements of, 33
    symptoms and diagnosis of, 33
    treatment of, 33, 34
  cystadenomata of, 630-634
    complications of, 640-645
    metastasis and malignancy of, 637
    serous, 634-636
    symptoms and diagnosis of, 645-651
    treatment of, 651
      incomplete ovariotomy, 661
      ovariotomy, 651-654
        accidents in, 660, 661
        after-treatment of, 659, 660
      procedure for, after Taber Johnson, 654-659
  cystic. *See* Ovaries, cystomata of
  cystic degeneration of, 139
  cystomata of, 670
    confusion of, with uterine myomata, 503
    of the corpus luteum, 672, 673
    of the Graafian follicle, 671, 672
    symptoms and diagnosis of, 674, 675
    treatment of, 675
      procedure for conservative, 676
      procedure for oöphorectomy, 675
    tuboövarian, 673, 674
  dermoid cysts of, 638-640
  descensus or hernia of, into labia majora, 4
  displacement of, 246, 247
    displacement of Fallopian tubes associated with, 244, 245
    symptoms and diagnosis of, 247, 248
    treatment of, 249
      procedure for, 249, 250

Packer, 845
Pacquelin cautery, use of, in attempt to remove a foreign body from the uterus, 274
Palmer, 793
Palpation, examination by, 812, 813
Panhysterectomy, 509
  abdominal, for carcinoma of the uterus, Wertheim procedure for, 576-582
    procedure for, 524-527
  enterovaginal fistula due to, 118, 119
  in streptococcus infection of the Fallopian tubes, 384
  in tuberculous infection of the uterus, 425
Paoli, 387, 423
Papillary carcinoma of the kidney, 553
Papillary cystadenomata of the breast, 662
Papillary cysts of the ovary, 635
Papillary form of cervical tuberculosis, 391
Papillary tumors of the ovaries, 550
Papilloma of the bladder, 552
  diagnosis of, 559
Papule, elevated, 353
  scaling, 353
Péraire, 411
Paralysis of the sphincter ani muscle, 168
Parametritis, turberculous, 392-394
Parasitic infections of the generative organs, 484-490
Parenchymatous metritis, atrophy of the uterus in, 708
Parenchymatous oöphoritis, 315
Parker, Rushton, 765
Parks, Charles T., 796
Paroöphoron, 677
  cysts of the broad ligament arising from, 678
Parovarium, cystomata of, 676-681
    symptoms and diagnosis of, 681, 682
    treatment of, 682
      Hall procedure for extirpation of intraligamentary cysts by excision of the uterus and appendages, 683, 684
Parovarium, cystomata of, treatment of, procedure for enucleation of an intraligamentary cyst, 682, 683
  definition of, 677
  structure of, 677
Parry, John S., 713
Parsons, A. W., 763
Parturition, anterior rectocele due to, 186
  carcinoma of the uterus and, 543
  cystitis following, 318, 319
  cystocele due to, 173
  displacements of the uterus due to, 192
  injuries of the bladder and, 144
  injuries of the perineum due to, 58, 65
  injuries of the urethra due to, 140
  injuries of the vulva due to, 58
  inversion of the uterus associated with, 749
  lacerations of the cervix uteri and, 122
  prolapse of the uterus and, 197, 239
  pudendal hematocele due to, 62, 63
  rectovaginal fistula due to, 114
  relation of, to uterine carcinoma, 547
  rupture of vagina due to, 101
  septate vagina complicating, 16
  streptococcus infection and, 368-372
  urethrocele due to, 171
  urethrovaginal fistula due to, 120
Parvin, 713
Pasteur's *vibrion septique,* 442
Patulous urachus, 44, 45. *See also* Urachus
Pavilion, surgical, 847, 848
Pawlick, 649
Péan, 390, 391, 533, 652
Péan forceps for morcellement, 530, 845
Péan procedure of morcellement, 530, 531
Pearse, 708
Peaslee, 641, 652
Pediculosis pubis, 485
Pelvic abscess, gonorrheal, treatment of, 333, 334
  vesicovaginal fistula due to, 104
Pelvic diaphragm, 189, 190, 191, 239
  relaxation of, in prolapse of the uterus, 197

Pelvic fascia, weakening of, in anterior rectocele, 186
    in cystocele, 173
Pelvic floor, 190, 191
  injuries to, 65-68
    causing prolapse of the uterus, 197
  relaxation or laceration of, in prolapse of the uterus, 197
  schematic representation of, 64
  structure of, 65-68
Pelvic hematoma, differentiation of gonococcus infection of the Fallopian tubes from, 325
Pelvic inflammations, displacements of the uterus due to, 192
Pelvic lymphatics, spirochæta-pallida infection of, 355
Pelvic outlet, enlargement of, by pubiotomy, 735-737
    by symphysiotomy, 734, 735
Pelvic peritoneum, involvement of, in prolapse of the uterus, 198, 200
  streptococcus infection of, pathology of, 372
  tuberculous infection of, pathology of, 402-404
    prognosis of, 416
    symptoms and diagnosis of, 416-418
    treatment of, 427, 428
Pelvic varicocele, 691-693
  medical treatment of, 693
  surgical treatment of, 693
    procedure for, 694
  symptoms and diagnosis of, 693
Pelviperitonitis, adhesive tuberculous, 400
  tuboövarian cysts and, 673, 674
Penetrating wounds of the uterus, 133, 134
Percussion note in ovarian tumor, 647
  in parovarian cysts, 681, 682
Periarteritis in polycystic degeneration of the kidney, 686
Pericystitis, 319, 474
  tuberculous, 405
Perimetritis, 459
  accompanying prolapse of the uterus, 200
Perinephritic abscess, 474, 475
  treatment of, 480, 481
Perinephritis, 474
Perinephritis fibrosa, 407
Perineum, anatomical considerations of, 66
  lacerations of, 64
    after-treatment of, 98, 100
    classification of, 65-68
    in cystocele, 173
    movable kidney and, 253
    prolapse of the uterus due to, 193, 194
    subcutaneous, 186
    symptoms and diagnosis of, 68-71
    treatment of, 71
    treatment of complete, Emmet procedure for, 89, 90
      Kelly procedure for, 93, 94
      Lauenstein procedure for, 92, 93
      Martin procedure for, 90-92
      principles of, 88, 89
      Reed procedure for, by the flap-splitting method, 94-96
      Ristine procedure for, 98, 99
      Tait procedure for, by flap-splitting method, 96-98, 99
    treatment of incomplete, Andrews procedure for, 78, 79
      Dudley operation in, 81
      Duke modification of Tait procedure for, 87, 88
      Emmet procedure for, 76-78
      Martin procedure for, 78-81
      Reed procedure for 74-76
      Reed procedure for, by flap-splitting method, 82-86
      Simon-Hegar procedure for, 81
      Tait procedure for, by flap-splitting method, 82, 86, 87
    urethrocele associated with, 171
  rupture of, rectovaginal fistula due to, 114
Perioöphoritis, 315
  due to streptococcus infection, 380
Perisalpingitis, accompanying prolapse of the uterus, 200
Peritoneum, metastases from ovarian cysts in, 637
  rupture of, 161
  tuberculous infection of, 396
Peritonitis, accompanying prolapse of the uterus, 200

Peritonitis, due to a foreign body in the bladder, 276
  due to streptococcus infection of the ovaries, 380
  fetal, rudimentary ovaries due to, 35
  following rupture of the kidneys, 161
  following rupture of ovarian cyst, 644
  following rupture of the uterus during pregnancy, 728
  in carcinoma of the rectum, 560
  ovarian tumor with adhesions and, 643
  pelvic, due to gonococcus infection, 306
  puerperal, 372
  tuberculous, 396
    ascites in, 648
    associated with tuberculous infection of the Fallopian tubes, 425
    pathology of, 402-404
Perivascular sarcoma of the kidney, 620
Pernicious vomiting of pregnancy, abortion indicated in, 710
Perspiration, abundant, in intertrigo of the vulva, 446, 447
  in puerperal infection, 376
Pessary, 210
  as foreign body in the vagina, 271, 272
  carcinomata of the vagina following use of, 542
  endometritis due to use of, 463, 464
  Graily Hewitt's cradle, 232
  presence of, in the uterus, 273
  rectovaginal fistula following use of, 114
  Smith-Hodge, procedure for introduction of, 210-213
    use of, following reposition of the uterus, 208
  use of, in anterior displacement of the uterus, 232
    in anterior rectocele, 186
    in cystocele, 177
    in infantile uterus, 24
    in pelvic varicocele and aneurysmal varix, 693
    in prolapsus of the uterus, 237, 238
  vesicovaginal fistula due to continued use of, 104
Peters, 536, 771
Petit, 673, 780
Peyton, Sharp and, 137
Pfannenstiel, 617, 619, 626, 632, 633, 634, 636, 637, 638
Pfannenstiel's test for pseudomucin, 633
Pfannenstiel's transverse infraabdominal incision, 859
Pfanneusterl, 550
Pfeiffer, 454
Pflüger's theory of menstruation, 768
Phagedenic chancroid, 362
Phantom tumor, differentiation of, from ovarian tumor, 650
Phenacetin, postoperative use of, 869
Phenol, in treatment of metrorrhagia, 779
Phimosis, patulous urachus due to, 44
Phleboliths, 691, 692
  in veins of the rectum, 695
Phthirius-inguinalis infection of the generative organs, 485
  treatment of, 485
Phthisis, amenorrhea in, 781
Pichevin, 469
Pick, 610, 616, 619, 626
Piles. *See also* Hemorrhoids.
  capillary, 695
  cutaneous, 695
  external, 695
  internal, 695
  thrombotic, 695
  venous, 695
Pilliet, 673
Pinard, 735
Pincus, 469
Pirmer, 396
Pirrung, 854, 855
Placenta, adherent fundal, inversion of the uterus in, 749
  deep implantation of, rupture of uterus due to, 727
  fundal implantation of, inversion of the uterus due to, 749
  in ectopic pregnancy, 717
  influence of, in making incision for Cesarean section, 744
  location of, in various positions of the fetus, 738
  removal of, in advanced ectopic pregnancy, 724-726

Placenta prævia, indication for Cesarean section, 737, 738
Placental souffle, in ectopic pregnancy, 721
Placentoma, malignant, 535
Plastic resection of the breast, Warren procedure for, 663, 664
Playfair, 737
Plethora, menorrhagia due to, 772
  treatment of, 774
Pleurisy with effusion, coexisting with tuberculous infection of the pelvic peritoneum, 415
Plumb, 760
Pneumococcus in the kidney, 319
Pneumococcus infection of the genitourinary organs, 438, 439
  symptoms of, 439
  treatment of, 439
Poirier, 395
Polsson, 582
Polycystadenomata of the breast, 662
Polycystic breast, 688
Polycystic degeneration of the kidney, 685. *See also* Kidney, cystomata of
Polycystomata of the breast, 662
Polypi, 493, 664, 665
  cervical, procedure for extirpation of, 531
    by écraseur, 531, 532
  of the rectum, 664, 665
  uterine, inversion of the uterus due to, 749
Polypoid growths, sarcomatous, in children, 612, 613
  of the uterus, 614
Porro operation, 746-748
  in presence of carcinoma of the uterus, 547, 575, 576
Porro procedure for removal of the parturient uterus—Mann, 747, 748
Portio vaginalis, carcinomata of, 543, 544
Position. *See* Examination, position of patient in
Posner, 317, 472
Potassium acetate, in treatment of tuberculous infection of the bladder, 429
Potassium bromid, postoperative use 869
Potassium iodid in treatment of me rhagia, 776, 777
  in treatment of syphilis, 360
Potassium permanganate in treat of carcinoma of the breast,
Pott, 691
Potter, 653
Potter procedure for digital exan tion of the vagina, 814
Poupinel, 668
Pozzi, 394, 395, 425, 489, 547, 649, 691
  sex development outlined by, 1
Pregnancy, after reduction of inve uterus, 751
  anteversion of the uterus complic by, 196, 197
  ascent of uterus due to, 203
  carcinomata of the uterus complic by, 546, 547, 557
    treatment in, 575, 576
  chorioepitheliomata of the u and, 535-538
  confusion of, with ovarian tumor,
    with sarcomata of the uterus,
  differentiation of echinococcus i tion from, 488
  differentiation of uterine myo from, 502, 503
  dysmenorrhea following, 784
  echinococcus infection and, 487
  ectopic. *See* Ectopic pregnancy
  evacuation of the uterus in, be viability of the fetus, 710 *See also* Abortion
  fibroadenomata of the breast and
  following criminal assault, 60
  in bicornate uterus, 26
  in one-horned uterus, 25
  influence of, in movable kidney,
  intraligamentous, 715
  intrauterine, coexisting with ect pregnancy, 722
  natural protection against uterin fection in, 293
  ovarian, confusion of cysts of corpus luteum with, 673
  ovarian tumor complicated by, 641

Pregnancy, ovariotomy in, 653
  parovarian cysts, complicated by, 681
  penetrating wounds of the uterus during, 133, 134
  progressive cutaneous atrophy of the vulva in, 703
  rupture of the uterus during, 727, 728
  streptococcus infection of the uterus during, 367, 368
  torsion of the pedicle of ovarian tumor in, 641
  tuberculous infection of the pelvic peritoneum and, 402
  uterine myomata and, 509-511
  vaginitis and, 457
  varicose veins of the broad ligament and, 692
  varicose veins of the vulva in, 691
Preparation of the patient for abdominal operation, 838
    in cases of emergency, 839
      procedure for hypodermoclysis, 841
      procedure for intravenous infusion of normal salt or the saline (Fischer's) solution, 840, 841
      procedure for transfusion of blood, 839, 840
    in elective cases, 841-843
  for examination, 807
Preuschen, 667
Price, 511, 715, 760
Priestly, 793
Pringle, transplantation of a urethra from a bullock to man by, 140
Probe, 821
Prochin, 727
Prochownik, 678
Procidentia uteri. *See* Prolapse of the uterus
Proctectomy. *See* Rectum
Proctoscope, Martin, 832, 833
Proctoscopic mirror, 836
Proctoscopy, Martin procedure for instrumental, 832-837
    Martin procedure for non-instrumental, 830-832
Proctotomy, internal, in carcinoma of the rectum, 598
Proctotomy, posterior, in carcinoma of the rectum, 598
Progressive cutaneous atrophy of the vulva, 702-704
  symptoms and diagnosis of, 704, 705
  treatment of, 705
    procedure for, 706
Prolapse, of the bladder, accompanying prolapse of the uterus, 198, 199
    in vesicovaginal fistulæ, 102
  of the funis, in rupture of the uterus during labor, 729
  of the rectum, 266
    Lange procedure for, 266
    Van Buren procedure for, 266
  of the urethra, Emmet procedure for, 172, 173
  of the uterus, 21, 193, 194. *See also* Uterus
    pathology of, 197
    symptoms and diagnosis of, 202, 203
    treatment of, 236-243
Proliferating cysts, 630
  of the ovary, incomplete ovariotomy for, 661
  ovarian embryomata accompanying, 638
Prostatic enlargement, patulous urachus due to, 44
Prostitutes, abscess of the vulvovaginal gland in, 301
  prevalence of gonococcus in vaginal discharges of, 298
  tuberculosis of the vulva among, 387
Protargol, use of, in gonorrhea, 331, 332
  in mixed infection of the kidney, 477
  in syphilis, 359
Proteus of Hauser, in the bladder, 318
  presence of, in cystitis, 473
Proteus vulgaris in the kidney, 319
  in mixed infection of the kidney, 474
Pruritus, due to Bacillus Ducrey infections, 361
  in ulcerated piles, 696
Pruritus vulvæ, in erythema of the vulva, 449
  in progressive cutaneous atrophy of the vulva, 703, 704

Pryor procedure of vaginal hysterectomy by hemisection of the uterus, 574, 575
Pryor traction forceps, 575
Psammomata, 635
  of the ovaries, 550
Pseudo-hermaphroditism, 4
  treatment of, 4, 5
Pseudomucin, 644
  presence of, in ovarian cysts, 633
  test for, 633
Pseudomucinous cysts, 630
  ovarian embryomata accompanying, 638
  rupture of secondary growths in, 644
  serous cysts compared with, 634, 635
Pseudomyxoma peritonei, 637
Psychoses of the menopause, 801, 802
Pubiotomy, Gigli procedure for, 735-737
Pubococcygeus muscle, 66, 67, 68
Puborectalis muscle, 67, 68
Pudendal hematocele, 62, 63. *See also* Hematocele
Puerperal infection, pathology of, 367-372
  symptoms and diagnosis of, 376, 377
  treatment of, 381-384
Puerperal peritonitis, 372
Pulmonary disease, menorrhagia due to, 773, 775
Pulse rate in puerperal infection, 377
Puncture, in gonococcus infection, 332
  of hydrocele of the round ligament, 684
  rectal, Byford's method of, 339
Puncture and drainage procedures for gonococcus infection, 334-342
Purse-string procedure for cystocele, 182
Pyelitis, 474, 475
  in prolapse of the uterus, 198
  tuberculous, 406
Pyelonephritis, 474, 475
  due to vaginal sarcoma, 613
Pyelotomy, Guiteras procedure for, 478, 479
  Reed procedure for, 477, 478
Pye-Smith, 685
Pyogenes albus in the vagina, 292
Pyogenes aureus, in the vagina, 292
Pyogenes citreus, in the vagina, 292
Pyometra, in tuberculous endometritis, 394
Pyonephrosis, 474, 475
  treatment of, 334
Pyosalpinx, 312-315
  accompanying uterine myomata, 502
  diagnosis of, 326
  fistulæ due to, 114
  tuberculous, 397
Pyuria, in mixed infections of the kidney, 475

Quain, 677
Quinin in treatment of infantile uterus, 24
  in treatment of menorrhagia, 777

Raceborsky, 768, 798
Radiography. *See* X-ray
Rafin's cases of renal calculi in children, 285
  of urethral calculi in children, 279, 280
Rape, injuries due to, 58
    symptoms and diagnosis of, 59-62
    treatment of, 62
  physical evidences of, 58
Ravogli, 362, 363, 364, 447, 448, 451, 452, 454, 455, 456, 484, 485
  classification of vulval chancres by, 352
  on late syphilitic ulcers of the vulva, 354
  on treatment of mucous patches, 359
von Recklinghausen, 493, 495, 498
Record form for case history, 805, 806
Rectal hook, 836
Rectal puncture, 339
Rectal tube, use of, following gunshot wounds of the rectum, 168
  following operation for cystocele, 184
  following ovariotomy, 660
  following perineal operations, 100
Rectal valves, 837
Rectocele, accompanying cystocele, 174, 175
  accompanying displacements of the uterus, 194
  anterior, 185

Rectocele, anterior, symptoms and diagnosis of, 186
    treatment of, 186
      procedure for, 187
  posterior, 264, 265
    procedure for, 265
Rectovaginal examination, procedure for, 837, 838
Rectovaginal fistula, 114
  due to carcinoma of the vagina, 564
  symptoms and diagnosis of, 114
  treatment of, 114-118
    Mayo-Robson procedure for, in high, 114-116
    Mayo-Robson procedure for, in low, 116-118
    Reed procedure for, by flap-sliding method, 118
    Reed procedure for, by flap-splitting method, 118
Rectum, adenocarcinoma of, 553
  adenomata of, 664
    symptoms and diagnosis of, 665
    treatment of, 665
  carcinomata of, palliative treatment of, 596-599
      colostomy or sigmoidostomy, 598, 599
      curettage, 597, 598
      divulsion, 598
      internal proctotomy, 498
      posterior proctotomy, 598
      procedure for (a) vaginal, (b) inguinal sigmoidostomy in inoperable cases, 599
    pathology of, 553, 554
    prognosis of, 553
    radical treatment of, 592
      Kraske procedure for extirpation of the rectum, 592
      C. H. Mayo procedure for extirpation of the rectum by abdominoperineal method, 595, 596
      W. J. Mayo procedure for extirpation of the rectum, 593
      J. B. Murphy procedure for resection of the rectum by the vaginal route, 593-595
    symptoms and diagnosis of, 560
  chancroids in, 361
Rectum, cystomata of, 689
  displacement of posterior wall of, 264, 265
    procedure for, 265
  disturbances of, in parovarian cysts, 681
  examination of, Martin procedure of instrumental proctoscopy, 832-837
    Martin procedure of non-instrumental proctoscopy, 830-832
    procedure for combined digital, of rectum and vagina, 837, 838
  fibrosarcoma of, 553
  foreign bodies in, 290
  gonococcus infection of, 319, 320
    symptoms and diagnosis of, 329
  gummata of, 358
  injuries of, 168
    symptoms and diagnosis of, 168
    treatment of, 168, 169
      procedure for restoration of the sphincter ani muscle, 169, 170
  malformations of, 51-55
  myomata of, pathology of, 500
  neoplasms of, composed of muscular and cartilaginous structures, 690
  polypi of, 664, 665
  prolapsus of, 266
    Lange procedure for, 266
    Van Buren procedure for, 266
  sarcoma of, 553
  spirochæta pallida infection of, 355
    diagnosis of, 358
  tuberculous infection of, pathology of, 407, 408
    prognosis of, 408
    symptoms and diagnosis of, 419
    treatment of, 430, 431
  tuberculous stricture of, 408
    treatment of, 431
  valves of, 837
  varicosities of. *See* Hemorrhoids
Reed, 511, 704
Reed method of suturing in Goffe procedure for cystocele, 178, 179
Reed procedure for abdominal panhysterectomy, 524-527
  for complete laceration of the perineum by the flap-splitting method, 94-96

Round ligaments, 190
  adenomyomata of, 626, 627
  Alquié-Alexander procedure for shortening, 216-218, 224, 225
  Baldy procedure for shortening, 225
  Barrett procedure for shortening, 222, 223
  changes in, in displacements of the uterus, 195
  Coffey procedure for combined shortening of broad ligaments and, 225-227
  cystoma (hydrocele) of, 684
    treatment of, 684
      Volbrecht procedure for, 685
  displacement of uterus and, 215
  Fergusson procedure for shortening, 218-220
  Gilliam procedure for shortening, 220-222
  Goffe procedure for shortening, by the vaginal route, 227-229
  Mann procedure for intraabdominal shortening of, 223-225
  relaxation of, in prolapsus of the uterus, 238
Rousan, 691
Rovsing, 317, 472
Rudimentary ovaries, 34-36. *See also* Ovaries
Runge's case of carcinoma of the portio vaginalis, 543
Ruppolt's case of double (?) Fallopian tube, 29
Rupture in tubal pregnancy, 719
  of bladder, 145
    Guiteras procedure for, 145, 146
  of ectopic pregnancy, 715, 716
    into the fold of the broad ligament, 719
      symptoms of, 719
    intraperitoneal, 719
    operation at time of, 723, 724
    primary intraperitoneal, symptoms of, 720
    secondary intraperitoneal, 720, 721
    treatment after, 724
  of kidney, 159-167. *See also* Kidney
  of ovarian tumor, 644, 645
  of parovarian cysts, 681, 682
  of peritoneum, 161
Rupture of uterus, during labor, 728, 729
      symptoms and diagnosis of, 729, 730
      treatment of, 730, 731
        procedure for (conservative), 731, 732
    during pregnancy, 727
      symptoms and diagnosis of, 727, 728
      treatment of, 728
    lacerations of the cervix and, 122
  of vagina, 101
  of varicose veins of the vulva, 691
Rutting and menstruation, 757-759

Sacralgia in gonococcus infection of the Fallopian tubes, 324
  in ovarian displacement, 247
Sactosalpinx. *See* Hydrosalpinx
Sactosalpinx hæmorrhagica, 311, 312
Sactosalpinx purulenta, 312-315
St. Braunwas, 731
St. Vitus dance, due to fusion of the clitoris, 3
Salicylate of ammonium in treatment of dysmenorrhea, 790
Salicylate of lithium in treatment of dysmenorrhea, 790
Salicylate of sodium, in treatment of dysmenorrhea, 790
Salicylic acid, in treatment of erysipelas of the vulva and vagina, 381
  in treatment of kraurosis vulvæ, 705
Salines in after-treatment of perineal operations, 100
  in treatment of constipation preceding operation, 842
  use of, in displacements of the uterus, 204
Salol, strychnin with, in treatment of constipation preceding operation, 842
  use of, in mixed infection of the kidney, 477
  use of, in tuberculous infection of the bladder, 429
Salpingitis, 470
  Bacillus coli communis and, 435
  chronic purulent, 308
  infections, 313

Salpingitis, surgical treatment of, 342-349
  symptoms and diagnosis of, 323-326
Salpingitis follicularis, 308
Salpingitis hæmorrhagica, 308
Salpingitis pseudofollicularis, 308
Salpingo-oöphorectomy, 342-349
  for cystomata, 675
  in ectopic pregnancy before rupture, 723
  Tait procedure for, 346-349
Salvarsan, 359, 360
Salzar's procedure for nitrous-oxid-oxygen anesthesia, 852, 853
Sampson procedure for transperitoneal implantation of the ureter into the bladder, 153, 154
Sänger, 322, 323, 331, 466, 500, 501, 535, 652, 737
Sänger procedure for Cesarean section, 742, 743
Sänger's case of tubal ostia, 30
Saprophytes, presence of, in puerperal infection, 370-372
Saprophytic infection of the genitourinary organs, 441
Sarcoma of the bladder, occurrence of, 551, 552
    pathology of, 620
    symptoms and diagnosis of, 622
    treatment of, 623, 624
  of the cervix, 614, 615
  of the kidney, pathology of, 620, 621
    symptoms and diagnosis of, 622
    treatment of, 623, 624
  of the ovary, pathology of, 617-620
    symptoms and diagnosis of, 622
  of the rectum, 553
  of the uterus, histology of, 615
    involvement of vagina in, 614
    occurrence of, 610
    pathology of, 614-617
    symptoms and diagnosis of, 621, 622
  of the vagina, pathology of, 612-614
    symptoms and diagnosis of, 621
  of the vulva, occurrence of, 610
    pathology of, 611, 613
    symptoms and diagnosis of, 621
Sarcoma of the vulva, originatin ovarian cysts, 637, 645
  palliative treatment of, 625
  pathology of, in general, 610, 61
  surgical treatment of, 623, 624
  toxin treatment of, 624, 625
Sarcoma deciduo-choriocellulare, 53
Saundby, 687
Sawizky, 386
Scaling papule, 353
Scalpel, 844
Scanzoni, 500, 681, 708, 737, 800
Schatz, 681
Schenck, 387
Schetelig, 500
Schick, 470
Schlesinger, 343
Schmidt's case of myoma of the b ligament, 501, 504
Schmorl, 393
Schöttlander, 391, 399, 400, 401
Schramm, 396
Schroeder, 191, 399, 403, 423, 469, 547, 617, 652, 678, 789
Schroeder procedure for lacerated vix uteri, 128, 129
  of partial (supravaginal) hyst tomy, 518, 520-522
Schuchardt, 395
Schüll, 393
Schultze, 464, 465
Scirrhous carcinomata of the b 555
Sclerosis of the peripheral layer o ovary in gonococcus infec 315
  of the uterine arteries, menorr due to, 774
    metrorrhagia due to, 779
Sebaceous cysts of the breast, 689
Segond procedure for high amput of the cervix, 567-569
Seilei, Marcase, 319
Self-inoculation of chancroid, 362,
Seminal stains in diagnosis of rap 61
Semiprone position. *See* Sims po
Senger, 312
Senile changes of the genitalia, lapse of the uterus due to, 1
Senile endometritis, 469

Senna, use of, in fecal tumors causing menorrhagia, 776
Septate uterus, 24. *See also* Uterus
Septate vagina. *See* Double vagina
Septic endometritis, 370, 371
Septic vibrion infection of the genitourinary organs, 442
Septicemia following rupture of ovarian cyst, 644
Serosa of the uterus, 461, 462
Serous (proliferating) cysts, 634-636
  histogenesis of, 635, 636
Sex, confusion of, 4
Sex development, as outlined by Pozzi, 1
Seydel's laparosalpingotomy, in 1784, 343
Sharp and Peyton, 137
Shock, following contusions of the kidney, 158
  in rupture of ectopic pregnancy, 721
  in rupture of the kidney, 160
  in rupture of tubal pregnancy, 719
  in rupture of the uterus during labor, 729
    during pregnancy, 728
Shönheimer, 792
Shoulder presentation, rupture of the uterus during labor due to, 728
Sigmoidostomy in inoperable carcinoma of the rectum, 598
  procedure for, 599
Silver nitrate, use of, in mixed infection of the kidney, 477
  in spirochæta pallida infection of the breast, 360
  in syphilis, 359
Simon, 611, 649
Simon's speculum, 846
Simon-Hegar procedure for lacerated perineum, 81, 82
Simpson, 708, 789
Simpson operation for complete laceration of the perineum, 93
Sims, 239, 565, 785, 789
  invention of the speculum by, 817
Sims' method of palliative treatment of uterine carcinomata, 565-566
Sims position, 809, 811, 817, 818
  in after-treatment of operation for vesicovaginal fistula, 113
Sims procedure for reposition and treatment of retrodisplaced uterus, 210
  for vesicovaginal fistula, 105-108
Sims speculum, 806, 807, 817, 818
Sims-Emmet self retaining speculum, 818
Sinclair, Sir William, 441
  on bacteriology of the uterus, and Fallopian tubes, 293
Single kidney, 48
Single laceration of the cervix uteri, 125
Sippel, 391, 402, 425
Sitz bath, in gonorrheal cystitis, 350
Skene, 534
Skene's description of Byrne procedure for ignohysterectomy, 569-572
Small cystic degeneration of the Graafian follicle, 671
Smith, Albert, pessary devised by, 210
Smith, Nathan, 652
Smith, Tyler, 754
Smith-Hodge pessary, procedure for introduction of, 210-213
  use of, following Küstner's procedure for instrumentodigital reposition of the uterus, 208
Sneguireff, 465, 469
Social evil, the, gonorrhea and, 298
Sodium acetate, use of, in tuberculous infection of the bladder, 429
Sodium benzoate, use of, in tuberculous infection of the bladder, 429
Sodium chlorid, in treatment of carcinoma of the breast, 609
Sodium iodid, in treatment of arteriosclerosis of the uterus, 709
  in treatment of syphilis, 360
Sodium phosphate in treatment of constipation preceding operation, 842
Sodium sulphate in treatment of constipation preceding operation, 842
Solitary kidney, 48
Solowij, 709
Soranus, 755
Sound, in examination of the bladder, 823
  infection of uterus due to use of, 367

Sound, uterine, 820, 821
    Ross, 820
Spaeth, 390, 749
Speculum, 817-820
  examination of cervical lacerations by, 125
  Gau, 818, 819
  Kelly cystic, 823, 824, 825
  Miller, 818
  Nott trivalve, 818, 819
  Simon's, 846
  Sims, 817, 818
  Sims-Emmet, 818
Sphincter, involvement of, in injury of the urethra, 140
  procedure for reëstablishing control by, in overdivulsion of the uterus, 142, 143
Sphincter ani muscle, 65
  procedure for restoration of, 169, 170
Sphincter vaginæ muscle, weakening of, in anterior rectocele, 186
    in cystocele, 173
Spiegelberg, 678, 681, 737
Spinal anesthesia, 850, 851
Spirochæta pallida, demonstration of, 357, 358
  intertrigo of the vulva due to, 446
Spirochæta pallida infection. *See also* Syphilis
  confusion of carcinoma of the vagina with, 556
  of the anus, 355
  of the bladder, 355
  of the breast, treatment of, 360
  of the Fallopian tubes, 355
  of the nipples, 355
    diagnosis of, 357, 358
  of the ovaries, 355
  of the pelvic lymphatics, 355
  of the rectum, 355
    diagnosis of, 358
  of the uterus, 354, 355
  of the vagina, 354
  of the vulva, 352-354
    diagnosis of, 357
    treatment of, 359, 360
  pathology of, 355, 356
  symptoms and diagnosis of, 356-358
  tertiary symptoms of, 356
Spirochæta pallida infection, treatment of, 358-360
Splanchnoptosis, displacements of the uterus due to, 192
Spleen, cystic degeneration of, accompanying cystic degeneration of the kidney, 685
Splenic disease, menorrhagia due to, 773, 775
Spohn, 630
Sponge holders, 845
Springs, treatment at, for vesical calculi, 277
Spronius, 343
Spurious labor, 722
Stab wound, rectovaginal fistula due to, 114
Staffordshire knot, 348, 349
Standing position, 810, 811
Staphylococci, cystitis due to, 473
  in the bladder, 318
  in the kidneys, 319
  in mixed infections, 443-445
  in mixed infection of the kidney, 474
  in puerperal infection, 368
Staphylococcus epidermidis albus, 444, 445
Staphylococcus pyogenes albus, 444
  bartholinitis due to, 457
  folliculitis of the vulva due to, 453
  in eczema of the vulva, 450, 453
  in gonococcus infection of the vulvovaginal gland, 301
  in mixed infection of the breast, 481
Staphylococcus pyogenes aureus, 444
  bartholinitis due to, 457
  in folliculitis of the vulva, 453
  in gonococcus infection of the vulvovaginal gland, 301
  in later stages of gonorrhea, 298
  in mixed infection of the breast, 481
Staphylococcus pyogenes citreus, 445
  folliculitis of the vulva due to, 453
Staphylococcus infection of the bladder, predisposing to tuberculous infection, 404
  of the genitourinary organs, 440
Stark, 548
Stark procedure for incontinence due to overdilatation of the cystic orifice of the urethra, 143

Steam, use of, for arresting intrauterine hemorrhage, 469, 470
  in myomata of the uterus, 469
  in streptococcus infection of the uterus, 469
  in subinvolution of the uterus, 469
Stearate of zinc, use of, in extroversion of the bladder, 40
Steffeck, 551, 636
Steinmetz, 551
Steinwitz's case of a catheter broken off in the bladder, 276
Stellate laceration of the cervix, 122, 125
Stemann, 397
Stenosis, cervical, due to anteflexion of the uterus, procedures for relief of, 233-235
  of the anus, 51-53. *See also* Anus
  of the aorta, accompanying rudimentary ovaries, 35
  of the cervical canal, dysmenorrhea due to, 785
    treatment of, 789
  of the vagina, 16
    diagnosis of, 17
    procedure for, 17
Stephenson, 765
Sterility, due to defective development of Fallopian tube, 28
  due to misplacement of Fallopian tube, 31
  due to retrodisplacements of the uterus, 200
  due to rudimentary ovaries, 35
  dysmenorrhea and, 789
  following myomectomy, 531
  in anterior displacements of the uterus, 201
  in infantile uterus, 23
  intermenstrual pain and, 794
  membranous dysmenorrhea and, 792
Sterilization of males, 137
  of women, 136
    procedure for, 137, 138
Sterilizing room, 847
Sternberg, 444
  description of the gonococcus by, 297
Stethoscope, 822, 823
Stirton. James, 757
Stockard's case of uterine myoma, 493
Stoerk, 621
Stolz, 737
Stomach, lavage of, under anesthesia, after abdominal operation, 868, 869
  vicarious menstruation from, 796
Storer, 746
Stratz, 498
Streptobacillus, 361
Streptococci, cystitis due to, 473
  in the bladder, 318
  in the kidney, 319
  in mixed infection of the kidney, 474
Streptococcus erysipelatus, 365
Streptococcus pyogenes, 365
  bartholinitis due to, 457
  in gonococcus infection of the vulvovaginal gland, 301
  in puerperal infection, 368-372
Streptococcus infection of the bladder, predisposing to tuberculous infection, 404
  of the external genitals, pathology of, 366, 367
    symptoms and diagnosis of, 376
    treatment of, 380, 381
  of the Fallopian tubes, mixed infection following, 470
    pathology of, 373-375
    pneumococcus infection contrasted with, 438
    symptoms and diagnosis of, 377-379
    treatment of, 384
  of the genitourinary tract, 365
    pathology of, in general, 365, 366
  of the ovaries, pathology of, 375, 376
    symptoms and diagnosis of, 379, 380
    treatment of, 384, 385
      procedure for resection of ovary, 385
  of the pelvic peritoneum, pathology of, 372
  of the uterus, pathology of, 367-372
    steam in treatment of, 469
    symptoms and diagnosis of, 376, 377
    treatment of, 381-384
      procedure for curettage, 382

Streptococcus infection, vaginitis following, 458
Streptothrix actinomyces, 490
Stricture of the Fallopian tube, 308, 309
  of the ureter, 46, 47
  tuberculous, of rectum, 408
    treatment of, 431
Stroganoff, 293, 438
Struma ovariana, 640
Strychnin, in treatment of constipation, 776
  in treatment of menorrhagia, 777
  postoperative use of, 869, 870
  with salve, in treatment of constipation preceding operation, 842
Subinvolution of the uterus, 192
  menorrhagia due to, 773, 774
Submucous myomata of the uterus, 493, 494
Subserous fibromyomata of the uterus, 494, 495
Sulphocarbolate of soda in treatment of erysipelas of the vulva and vagina, 381
Sulphonal, in treatment of dysmenorrhea, 790
Sulphur, in treatment of eczema marginatum, 484
Superfetation in two-horned uterus, 26
Supernumerary breasts, 56, 57. *See also* Breast
Supernumerary Fallopian tubes and ostia, 28-30. *See also* Fallopian tubes
Supernumerary ureter, 46
Suppositories of opium and belladonna in hemorrhoids, 696
Suppressed kidney, 50
Suppuration of the Fallopian tubes, 312-315
  of gestation sac and fetus in ectopic pregnancy, 722
Suprapubic cystostomy, procedure for, in carcinomata of the bladder, 586, 587
Suprapubic operation for sarcoma of the bladder, 623
Supravaginal hysterectomy, 508
  by hemisection of the uterus without removal of the appendages, procedure for, 522-524
Supravaginal hysterectomy, in
    removal of the appendag
    procedure for, 516-520
  partial, Schroeder procedure f
    520-522
Surgical injuries of the bladder,
Suspension procedures for r
    placed uterus, 213
  Kelly, 213-215
Sutton, 670
Sutton procedure for cystocele, 1
Suture, Berkeley and Bonney pl
    248
  crown, 84, 88
  deep subcuticular, 865
  figure-of-eight, 865
  interrupted through-and-throu
    en masse, procedure for
    of abdominal incision b
    865
  laminated, procedure for clos
    abdominal incision by, 86
Sweats in mixed infection of t
    ney, 476
  in tuberculous infection of t
    tum, 419
Switalski, 397
Sycosis. *See* Folliculitis.
Symphysiotomy, procedure for
    735
Syncytioma malignum, 535-537
  of the vulva, 612
  symptoms and diagnosis of, 53
  treatment of, 537, 538
Syphilids, vulval, differentiati
    tuberculous ulcers from,
Syphilis, 352-360. *See also* Spi
    pallida infection
  differentiation of herpes fro
    456
  following rape, 60
  intertrigo due to, 448
  rectovaginal fistula due to, 11
  treatment of, at the menopau
  urethrovaginal fistula due to,
Szancer's case of echinococcus
    tion, 488

T-drainage tube, 336, 866
Tachycardia at the menopause. S
    treatment of, 803

Tait, 298, 344, 641, 645, 650, 652, 705, 713, 754, 768
Tait (Lawson) colpocystotomy forceps for removal of foreign bodies from the uterus, 274
Tait curved trocar, 655
Tait (Lawson) method of reposition of an inverted uterus, 753
Tait procedure for complete laceration of the perineum by the flap-splitting method, 96-98, 99
  for extirpation of uterine appendages in gonococcus infection, 346-349
  for incomplete laceration of the perineum, 73
    by the flap-splitting method, 82, 86, 87
Tamponade following evacuation of echinococcus cysts, 489
  following Küstner's procedure for instrumento-digital reposition of the uterus, 208
  for arrest of hemorrhage from uterine myomata, 505, 506
  for suppression of the menses, 763, 764
  glycerin, in diagnosis of mixed infection of the uterus, 465
  glycerin or boroglycerid, in treatment of endometritis, 468
  ichthyol and boroglycerid, in treatment of intermenstrual pain, 794
  in anterior displacements of the uterus, 232
  in anterior rectocele, 186
  in arteriosclerosis of the uterus, 709
  in atrophy of the vagina with fusions, 707
  in cervical lacerations, 126
  in cystocele, 177
  in eczema of the vulva, 451
  in gonorrhea, 332, 333
  in hydrocele of the round ligament, 684
  in menorrhagia, 775
  in oidium-albicans infection, 434
  in pelvic varicocele and aneurysmal varix, 693
  in prolapsus of the uterus, 237
  in retrodeviations of the uterus, 208, 209
Tamponade in vaginitis, 459
  procedure for induction of abortion by, 712
  vaginal, for reduction of uterine inversion, 754
Tannic acid in treatment of metrorrhagia, 779
Tannin, use of, in kraurosis vulvæ, 705
Temesvary, 618
Tenaculum, 822, 847
  Cullen's, 845
Tenesmus, due to adenomata of the rectum, 665
  in anterior displacements of the uterus, 201
  in gonococcus infection of the rectum, 329
  in hemorrhoids, 695
  in posterior rectocele, 264
  in prolapsus of the uterus, 202
  in renal calculi, 286
  in sarcoma of the bladder, 622
  in tuberculous infection of the bladder, 417
  in urethral calculus, 275
Teratomata, 640
  of the ovary, 638-640. *See also* **Embryomata**
Themison, 754, 755
Thiriar procedure for abdominal cuneihysterectomy, for anteflexion of the uterus, 235
Thiriar-Reed procedure for intraabdominal cuneihysterectomy, 230-232
  Coffey's adaptation of, to vaginal route, for anteflexed uterus, 235, 236
Thomas, 628, 688, 755, 793
  pessary devised by, 210
Thomas serrated spoon-saw, 528
Thomson, 253
Thorn, 393
Thornton, 641, 642, 652, 653
Thrombi, accompanying aneurysmal varix, 693
  formation of, in puerperal infection, 369
Thrombosis of vessels of Fallopian tubes, hematosalpinx due to, 312
Thrombotic piles, 695

Thrush of the vulva, 434
Thyroid tumor of the ovary, 640
Tiersch procedure for extroversion of the bladder, 41, 42
Tilt, 798
Toilet of the peritoneum in tuberculous infection, 427, 428
Tollaud, 424
Torsion of the pedicle complicating ovarian tumor, 641, 642, 647
  in ovarian tumor complicated by pregnancy, 641
  of parovarian cysts, 681
Toxemia in ovarian tumor with twisted pedicle, 647
  systemic, in ovarian tumor with twisted pedicle, 642
Toxin treatment of inoperable sarcomata, 624, 625
Transfusion of blood, procedure for, 839, 840
Transperitoneal cystostomy, C. H. Mayo procedure for, 587-590
Transperitoneal exposure of the ureter, procedure for, 149
Transperitoneal method of exposing kidney, Israel's, 163, 164
Transperitoneal uretero-vesical implantation, Guiteras procedure for, 152, 153
  Sampson procedure for, 153, 154
  Van Hook procedure for, 154, 155
Transplantation of urethra from lower animals to man, 140
Transverse infraabdominal incision, 859
Transverse umbilical incision, 856, 857
Transverse suprapubic incision, 857
Transversus perinei muscle, 65
  in anterior rectocele, 186
Trauma, aneurysmal varix due to, 692
  cystitis due to, 471, 472
  galactocele due to, 688
  hematosalpinx due to, 312
  injuries of the bladder due to, 144
  mixed infection of the kidneys following, 475
  rupture of uterus due to, 727
  rupture of vagina due to, 101
  vaginal cysts due to, 667
Trekaki, 253

Trendelenburg position, 811
  in vaginal enterocele, 267, 268
Trendelenburg procedure for ext
sion of the bladder, 41
Treub, 749, 750
Trichophyton-tonsurans infection
generative organs, 484, 485
Trifid uterus, 21
Trional, in treatment of dysmeno
790
  postoperative use of, 869
Trocar, Tait curved, 655
Trophoblast, 717
Tubal pregnancy. *See* Ectopic
nancy
Tubercle bacillus, cystitis due to, 473
Tuberculin, 416
Tuberculosis, corporeal, 392-394
Tuberculous cystitis, 318, 319, 473
Tuberculous endometritis, 392-394
Tuberculous infection of the bl
pathology of, 404, 405
    symptoms and diagnosis of, 418
    treatment of, 428-430
  of the body of the uterus, 411,
  of the breast, pathology of, 408
    symptoms and diagnosis of,
    treatment of, 431, 432
  of the cervix uteri, pathology of
391
    symptoms and diagnosis of, 410
  of the Fallopian tubes, mixed
tion following, 470
    pathology of, 394-399
    prognosis of, 413
    symptoms and diagnosis of, 413
    treatment of, 425, 426
  of the genitourinary tract, 386
  of the kidney, pathology of, 4
    prognosis of, 419
    symptoms and diagnosis of, 419
    treatment of, 430
  of the ovaries, pathology of, 39
    symptoms and diagnosis of, 414
    treatment of, 426

Tuberculous infection of the pelvic peritoneum, pathology of, 402-404
    prognosis of, 416
    symptoms and diagnosis of, 414-416
    treatment of, 427, 428
  of the rectum, pathology of, 407, 408
    prognosis of, 408
    symptoms and diagnosis of, 419
    treatment of, 430, 431
  of the urethra, treatment of, 428
  of the uterus, pathology of, 390-394
    symptoms and diagnosis of, 409-412
    treatment of, 424, 425
  of the vagina, confusion of carcinoma of the vagina with, 556
    pathology of, 389, 390
    symptoms and diagnosis of, 410, 411
    treatment of, 423, 424
  of the vulva, pathology of, 387-389
    symptoms and diagnosis of, 408, 409
    treatment of, 423, 424
  pathology of, in general, 386, 387
  syphilis of vulva and, 354
  treatment of, in general, 420-423
  vaginitis following, 458
Tuberculous mastitis, pathology of, 408
Tuberculous nephropyosis, 406
Tuberculous parametritis, 392-394
Tuberculous pericystitis, 405
Tuberculous peritonitis, 396. *See also* Peritonitis
  ascites in, 648
Tuberculous pyelitis, 406
Tuberculous pyosalpinx, 397
Tuboabdominal pregnancy, 715
Tuboövarian cyst, 310, 311
Tuboövarian cystomata, 673, 674
Tuboövarian pregnancy, 715
Tubouterine gestation, 714
Tuffier, 406, 435
Tuffier procedure for spinal anesthesia, 850, 851
Tumor formation in tuberculous infection of the Fallopian tubes, 397, 399, 413
  in tuberculous infection of the ovaries, 414
Tumor formation in tuberculous infection of the pelvic peritoneum, 402, 403, 404, 415
  in tuberculous infection of the vulva, 409
Tumors, abdominal, displacements of the uterus due to, 194
  menorrhagia due to, 773
  fecal, 773, 776
  hemorrhoidal, 695
  intrapelvic, vaginitis and, 457
  intravesical, cystitis due to, 471
Turck (Fenton B.) method of covering abdominal wall with rubber dam, 861, 862
Turck's formula for Irish moss jelly and vaselin, 258
Tuttle clamp and cautery procedure for hemorrhoids, 698, 699
Tympanites in tuberculous infection of the pelvic peritoneum, 414
Typhoid bacillus in the kidney, 319
Typhoid fever, differentiation of tuberculous infection of the pelvic peritoneum from, 416
Two-horned uterus, 25, 26. *See also* Uterus
  double uterus differentiated from, 25

Ulceration in adenocarcinoma of the breast, 554
  in carcinomata of the body of the uterus, 544
    of the cervix uteri, 544
    of the portio vaginalis, 543, 544
    of the rectum, treatment of, 597, 598
    of the urethra, 551
    of the vagina, 541, 542
    of the vulva, 540, 555
  in hemorrhoids, 696
  in sarcomata of the vagina, 613
    of the vulva, 621
  of the bladder, vesicovaginal fistula due to, 104
  of the cervix, menorrhagia due to, 774
  of the "womb," 123
  rectovaginal fistula due to, 114
Ulcers. *See also* Chancre and Chancroid

Ureters, involvement of, in prolapsus uteri, 198
  in tuberculosis of the kidney, 406
 Kelly procedure for extirpation of kidney and, in carcinoma, 591
 malformations of, 46, 47
 Maydl procedure for transplanting, in extroversion of the bladder, 42
 Morris procedure for extraperitoneal exposure of, by the lumbo-ilioinguinal route, 149, 150
 procedure for transperitoneal exposure of, 149
 stricture of, 46, 47
Urethra, absence of, 37
 atresia of, patulous urachus due to, 44
 calculi in, 275
 carcinomata of, pathology of, 551
  symptoms and diagnosis of, 558, 559
  treatment of, 582
   procedure for urethrectomy, 582-584
 dilatation of, for removal of foreign bodies from the bladder, 278
 examination of, 823
 foreign bodies in, 140, 275
  symptoms and diagnosis of, 275
  treatment of, 275
 gonococcus infection of, 317-319
  local or surgical treatment of, 350
  medical treatment of, 349, 350
  symptoms and diagnosis of, 327
 injuries of, 140
  symptoms and diagnosis of, 140
  treatment of, 140
   Kelly procedure for reëstablishment, 141
   procedure for reëstablishing sphincteric control, 142, 143
   Stark procedure for incontinence due to overdilatation of the cystic orifice, 143
 involvement of, in tuberculosis of the vulva, 388
 malformations of, 37-39
 prolapse of, Emmet procedure for, 172, 173
 removal of sarcomata of the bladder through, 623
Urethra, shrinking of, in vesicovaginal fistula, 103
 stricture of, cystitis and, 471
 tuberculous infection of, treatment of, 428
Urethrectomy, procedure for, for carcinoma, 582-584
Urethritis, development of, in urethrocele, 171
 follicular, 317
 gonorrheal, 317
Urethrocele, 171, 172
 symptoms and diagnosis of, 171
 treatment of, 171
  Emmet procedure for, 172, 173
Urethrovaginal fistula, 120
 symptoms and diagnosis of, 120
 treatment of, 120
  procedure for, 120, 121
Urinalysis, in renal calculi, 286, 287
Urinary fistulæ, classified, 102
Urinary stasis, due to vaginal sarcoma, 613
Urination, frequent, in movable kidney, 256
 in hypospadias, 38
 painful, in foreign bodies in the bladder, 276
Urine, bloody, in rupture of the kidney, 160
 character of, in extroversion of the bladder, 40
  in gonococcus infection of the kidney, 329
  in gonorrheal cystitis, 327, 328
  in mixed infection of the kidney, 476
  in ovarian tumors, 647
  in polycystic kidney, 687
  in renal calculi, 286
  in tuberculous cystitis, 473
  in tuberculous infection of the bladder, 417
  in tuberculous infection of the kidney, 418
 decomposition of, in foreign bodies in the bladder, 276
 diminished flow of, in injuries of the bladder, 145
 escape of, from navel, in patulous urachus, 44

Urine, escape of, in urethrocele, 171
  through vagina, in urethrovaginal fistula, 120
 extravasation of, into suprapubic tissue, in injuries of the bladder, 145
 incontinence of, due to injuries of the bladder, 145
  due to overdilatation of cystic orifice of the urethra, Stark procedure for, 143
  following curettage of the bladder, 585
  following injury of the urethra, 140
  in atypical hymen, 6
  in cystocele, 175
  in duplication of the ureters, 46
  in epispadias, 39
  in hypospadias, 38
  in parovarian cysts, 681
  in ureterovaginal fistula, 113
  in vesicocervical fistula, 129
  in vesicovaginal fistula, 104
 retention of, in mixed infections of the kidney, 475
Urines, examination of, by segregation, 827-830
  Harris procedure for, 830
Urotropin, use of, in mixed infection of the kidney, 477
 in renal calculus, 288
 in tuberculous infection of the bladder, 429
 in ureteral calculus, 281
 in vesical calculi, 277
Ustilago, in treatment of menorrhagia, 776
Uterine appendages, extirpation of, atrophy of the vulva and, 704
  for infections, 342-349
Uterine arteries, ligation of, for myomata, by the abdominal route, 508
  by the vaginal route, 507, 508
Uterine dressing forceps, 822
Uterine inertia, inversion of the uterus due to, 750
Uterine irrigator, Fritsch, 469
Uterine ligaments. *See also* Round ligaments and Broad ligaments
Uterine ligaments, changes in, in placement of the uterus, 1
 operations for shortening, 215-2
Uterosacral ligaments, 190
 Bovée procedure for shortening
 changes in, in displacements o uterus, 195
 contraction of, in forward dis ments of the uterus, 196
 procedure for shortening, by th dominal route, 242, 243
 relaxation of, in prolapsus of uterus, 238, 239
Uterus, absence of, with absenc Fallopian tubes, 27
 absence and rudimentary de ment of, 22
  symptoms and diagnosis of, 2
  treatment of, medical, 23
   surgical, 23
 adenoma of, 627-629
 adenoma malignum of, 627-629
  symptoms and diagnosis of, 6
  treatment of, 629
 adenomyomata of, 627
 anatomical considerations of, 20
 anteflexion of, 195, 196
  dysmenorrhea and, 786
  symptoms and diagnosis of, 202
  treatment of, Dudley proc for, 234-235
 anterior displacements of, mea for relief of cervical ste due to, 233
  treatment of, 232-236
   Coffey procedure for vagina neihysterectomy for, 235,
   Thiriar procedure for abdo cuneihysterectomy for, 23
 anteversion of. *See* anterior placements of
 arteriosclerosis of, 708
  symptoms and diagnosis of, 7
  treatment of, medical, 709
   surgical, 709
 ascent of, symptoms and diag of, 203
 atrophy of, 708, 709. *See als* teriosclerosis of
  at the menopause, 799

- Uterus, attenuated, 721, 722
  - bacillus coli infection of, 435
  - bicornate, rupture of uterus in pregnancy in, 727
  - carcinoma of, metrorrhagia due to, 778, 779
    - palliative treatment of, 564-566
      - Byrne procedure of ignohysterectomy, 569-572
      - procedure for high amputation of the cervix for control of persistent hemorrhage, 567
      - Segond procedure for high amputation of the cervix, 567-569
    - pathology of, 542-548
    - radical treatment of, 572
      - Newman procedure for vaginal hysterectomy, 572-574
      - Pryor procedure of vaginal hysterectomy by hemisection of the uterus, 574, 575
      - Wertheim procedure for abdominal panhysterectomy, 576-582
    - symptoms and diagnosis of, 556-558
  - changes in, at the menopause, 799
    - in ectopic pregnancy, 718, 719, 720, 721
  - chorioepitheliomata of, 535-537
    - symptoms and diagnosis of, 537
    - treatment of, 537, 538
  - curettage of, 822
  - cystomata of, 669
    - symptoms and diagnosis of, 669
    - treatment of, 669
  - dilatation of, 821, 822
  - diseases of, complicating parovarian cysts, 681
    - displacement of Fallopian tubes associated with, 245
  - displacements of, 188-243
    - causes of, 191-194
    - classified, 188
    - cystitis due to, 471
    - differentiation of gonococcus infection of the Fallopian tubes from, 325
    - dysmenorrhea in, 786
    - endometritis associated with, 464
    - movable kidney and, 253, 254
- Uterus, displacements of, pathology of, 194-200
  - symptoms and diagnosis of, 200-203
  - treatment of, in general, 203, 204
  - varicocele and aneurysmal varix due to, 692
  - double, 24
    - symptoms and diagnosis of, 25
    - treatment of, 25
  - dysmenorrhea due to tumors of, 786
  - echinococcus cyst of, 669
  - echinococcus infection of, 487, 488
  - endotheliomata of, 616, 617
  - fetal, 20, 21
    - accompanying rudimentary ovaries, 35
  - fibrocystoma of, differentiation of ovarian tumor from, 650
  - fibrocysts of, 627, 669
  - fibromata of, abortion indicated in, 710
    - Cesarean section indicated in, 738
  - fibromyomata of, sarcomatous degeneration of, 617
    - subserous, 494, 495
  - flexion of, 188
    - dysmenorrhea due to, treatment of, 787-789
  - follicular cysts of, 669
  - foreign bodies in, 273
    - symptoms and diagnosis of, 274
    - treatment of, 274
  - gonococcus infection of, 302-304
    - steam in treatment of, 469
  - hyperinvolution of, following delivery, 708
  - hypertrophy of, in ectopic pregnancy, 716, 717
  - infantile, 23
    - accompanying rudimentary ovaries, 35
    - dysmenorrhea in, 784
      - treatment of, 787
    - removal of, 24
    - symptoms and diagnosis of, 23
    - treatment of, 23, 24
  - injuries of, 122-135
  - instrumental examination of, 816-823
  - inversion of, 749-751
    - symptoms and diagnosis of, 751, 752

- Uterus, inversion of, treatment of, in recent or acute cases, 752
      - procedure to arrest hemorrhage, 752
      - procedure for reduction of, by manipulation, 753
    - treatment of, in chronic cases, 753-755
      - Kehrer procedure for, 753, 754
  - involution of, following spurious labor, 722
  - lacerations of cervix of, 122-129. *See also* Cervix uteri
  - lateral displacements of, treatment of, 243
  - malformations of, 20-26
  - malpositions of, menorrhagia due to, 774
  - menorrhagia due to affections of, 773, 774
  - mixed infection of, 459-464
    - accompanying neoplasms of, 464
    - procedure for exploratory curettage in, 465, 466
    - symptoms and diagnosis of, 464
    - treatment of, 466-470
      - procedure for topical, 468
  - myochondroma of, 498
  - myomata of, Cesarean section indicated in, 738
    - conservative surgical treatment of, 507, 508
    - evolution of types of, 496
    - interstitial, 494
    - palliative treatment of, 505-507
      - procedure for arrest of hemorrhage, 505, 506
    - pathology of, 493-499
    - radical treatment of, 508-532. *See also* Myomata
    - steam in treatment of, 469
    - submucous, 493, 494
    - subserous, 494, 495
    - symptoms and diagnosis of, 502-504
  - nervous organization of, 764
  - normal bacteriology of, 293
  - normal position of, 188-191
  - one-horned, 25
    - accompanying absence of one Fallopian tube, 27
- Uterus, one-horned, accompanying sence of one ovary, 34
    - accompanying single kidney, 48
    - symptoms and diagnosis of, 25
    - treatment of, 25
  - penetrating wounds of, 133
    - symptoms and diagnosis of, 13
    - treatment of, 134, 135
  - polypi of, differentiation of vagi cysts from, 668
  - pregnant, evacuation of, 710, 711
      - procedure for, by gauze pa 712
      - procedure for, by incision of cervix, 712
      - Whitridge Williams proced for, by dilatation and cu tage, 711
  - procedure for excision of, for ex pation of intraligamentary p ovarian cysts, 683, 684
  - prolapse of, accompanying cystoc 174, 175
    - endometritis following, 464
    - hygienic treatment of, 236, 237
    - mechanical treatment of, 2 238
    - medicinal treatment of, 237
    - procedure for restoration of bl der wall in cystocele complic ing, 182-184
    - prolapse of vagina and, 192, 1
    - surgical treatment of, 238-243
      - Bovée procedure for shorten the uterosacral ligaments,
      - procedure for shortening uterosacral ligaments, by abdominal route, 242, 243
      - Reed procedure for superior porrhaphy for, 239-242
    - vaginal enterocele and, 267
  - relation of myomata of the br ligament to, 500, 501
  - removal of. *See* Hysterectomy
    - in double uterus, 25
    - in puerperal infection, 383
  - retrodeviations of, posture, mass and tamponade in treatment 208-210
  - retrodisplacements of, instrume treatment of, 210-213

Uterus, retrodisplacements of, surgical treatment of, in general, 213
suspension procedures for, 213-215
topical and manipulative treatment of, 204
Küstner procedure for, 204-208
treatment of conditions associated with, 229-232
retroflexion of, abortion indicated in, 710
rhabdomyoma of, 498
rôle of, in menstruation, 766, 767
rudimentary, removal of, 23
rupture of, during labor, 728, 729
symptoms and diagnosis of, 729, 730
treatment of, 730, 731
procedure for (conservative), 731, 732
during pregnancy, 727
symptoms and diagnosis of, 727, 728
treatment of, 728
sarcomata of, histology of, 615
involvement of vagina in, 614
occurrence of, 610
pathology of, 614-617
symptoms and diagnosis of, 621-622
septate, 24
symptoms of, 24
treatment of, 24
spirochæta pallida infection of, 354, 355
streptococcus infection of, pathology of, 367-372
steam in treatment of, 469
symptoms and diagnosis of, 376, 377
treatment of, 381-384
procedure for curettage, 382
subinvolution of, menorrhagia due to, 773, 774
steam in treatment of, 469
trifid, 21
tuberculous infection of, pathology of, 390-394
symptoms and diagnosis of, 409, 410, 411, 412
treatment of, 424, 425
two-horned, 25
Uterus, two-horned, accompanying rudimentary ovaries, 35
symptoms and diagnosis of, 26
treatment of, 26
Uterus accessorius, 21
Uterus bicornis, 20, 25, 26
Uterus duplex, 20, 24, 25
Uterus septus, 24
Uterus unicornis, 20, 25

Vagina, absence of, 8
Baldwin procedure in, 12-14
Fargas procedure in, 11, 12
Fergusson procedure in, 10, 11
procedure in, 8-11
atresia of, 17
hematosalpinx due to, 312
symptoms and diagnosis of, 18
treatment of, 18
Walton procedure for, 19
atrophy of, 707
symptoms and diagnosis of, 707
treatment of, 707
bacillus coli infection of, 435, 436
calculus in, due to vesicovaginal fistula, 104
carcinoma of, differentiation of myomata from, 501
pathology of, 541, 542
symptoms and diagnosis of, 556
treatment of, 562
palliative, 564
procedure for extirpation of the vagina by the abdominal route, 562, 563
procedure for extirpation of the vagina and uterus from below, 563
chancre of, 354
changes in, in prolapse of the uterus, 198
cystomata of, 666-668
symptoms and diagnosis of, 668
treatment of, 668
procedure for enucleation, 668, 669
dermoid cysts of, 667
diphtheria of, 433
displacement of, 171-187
displacement of posterior wall of, 185

- Vagina, displacement of posterior wall of, symptoms and diagnosis of, 186
    - treatment of, 186
        - procedure for, 187
  - distoma-hematobium infection of, 486
  - double, 14, 15
    - procedure for, 16
    - symptoms and diagnosis of, 16
  - erysipelas of. *See* streptococcus infection of
  - endothelioma of, 614
  - examination of, procedure for combined, of rectum and vagina, 837, 838
  - fistulæ of, 101-121
    - rectovaginal, 114-118. *See also* Rectovaginal fistulæ
    - ureterovaginal, 113, 114. *See also* Ureterovaginal fistulæ
    - vesicovaginal, 102-113. *See also* Vesicovaginal fistulæ
  - foreign bodies in, 271
    - symptoms and diagnosis of, 272
    - treatment of, 272
  - gonococcus infection of, 299
    - cysts due to, 669
  - injuries of, 101-121
  - instrumental examination of, 816-823
  - malformations of, 6-19
  - mixed infection of, 457, 458
    - symptoms and diagnosis of, 458
    - treatment of, 458
        - procedure for cleansing in, 458, 459
  - myomata of, pathology of, 492, 493
    - symptoms and diagnosis of, 501, 502
    - treatment of, procedure for, 505
  - myxosarcoma of, 613
  - normal bacteriology of, 291-293
  - Potter procedure for examination of, 814
  - oidium-albicans infection of, 434
  - prolapse of, prolapse of uterus and, 192, 193, 194
  - removal of sarcoma of the bladder through, 623
  - rupture of, symptoms and diagnosis of, 101
    - treatment of, 101
- Vagina, sarcomata of, pathology 612-614
    - symptoms and diagnosis of, 62
  - spirochæta pallida infection of,
  - stenosis of, 16
    - diagnosis of, 17
    - procedure for, 17
  - streptococcus infection of, pathc of, 366, 367
    - symptoms and diagnosis of, 3
    - treatment of, 380, 381
  - tuberculous infection of, confusic carcinoma with, 556
    - pathology of, 389, 390
    - symptoms and diagnosis of, 410
    - treatment of, 423, 424
  - unilateral, accompanying absenc one ovary, 34
- Vaginal Cesarean section, 748
- Vaginal cystostomy, in carcinom the bladder, 585
- Vaginal discharge, normal, 292, 29
  - pathological, 293
- Vaginal enterocele, 267-270. *See* Intestines, displacements of
- Vaginal fistulæ, 101-121
  - due to tuberculous infection, 410
- Vaginal hernia, 267
- Vaginal hysterectomy by hemise of the uterus, Pryor proce for, 574, 575
  - for carcinoma of the uterus, New procedure for, 572-574
- Vaginal hysterovaginectomy, 563
- Vaginal myomectomy for submu myomata, 527-529
  - for tumors of the cervix, proce for, 527
- Vaginismus, kraurosis vulvæ diff tiated from, 705
- Vaginitis, 457, 458
  - emphysematous, 458
  - granular, differentiation of mi tuberculosis from, 410
  - symptoms and diagnosis of, 458
  - treatment of, 458-459
  - tuberculous, symptoms and diag of, 410, 411
- Vaginitis senilis, 457
- Vagino-enterocele, 267-270. *See* Intestines, displacements of

Van Buren, 665
Van Buren procedure for prolapsus of the rectum, 266
VanderVeer, 511, 653, 661
Van Henkelom, 536, 717
Van Hook, 47
Van Hook procedure for transperitoneal implantation of the ureter into the bladder, 154, 155
  for ureteroureteral anastomosis, 151, 152
Vaporization, 469, 470
Varices, treatment of, at the menopause, 802
Varicocele, pelvic, 691-694. *See also* Pelvic varicocele
Varicose veins, myomata of the vagina due to, 502
  of the broad ligament, 691, 692
  of the rectum. *See* Hemorrhoids
  of the vulva, 690, 691
Varix, aneurysmal, 691-694. *See also* Aneurysmal varix
Vascular endothelioma of the kidney, 620
Vasectomy, 137
Vaselin, use of, following removal of hemorrhoids by ligature and cautery, 698
Vassmer, 391, 393
Veit, 312, 395, 397, 399, 411, 495, 613, 616, 628, 666, 668
von Velits, 620, 636
Venous piles, 695
Ventral hernia, 661
Ventrofixation, of the pelvic organs, vicarious menstruation in, 795
  of the uterus, 215
Ventrosuspension of the uterus, 203
Veratrum viride, use of, at the menopause, 803
Vermeil, 770
Verneuil, 695
Version, in rupture of the uterus, 730
  of the uterus, definition of, 188
Vertical median incision, 856
Vesicoabdominal fistula, congenital, 44
Vesicocele. *See* Cystocele
Vesicocervical fistula, 103, 129
  procedure for repair of, 131, 132
  symptoms and diagnosis of, 129
Vesicouterine fistula, 130
  procedure for, 131, 132
Vesicovaginal fistula, 102-104
  after-treatment of operation for, 112, 113
  symptoms and diagnosis of, 104-105
  treatment of, 105-112
    Fargas procedure for, 112
    Reed procedure for, by the flap-sliding method, 110-112
    Reed procedure for, by the flap-splitting method, 108-110
    Sims procedure for, 105-108
Vibrion septique, 442
Vicarious hemorrhage, in imperforate hymen, 8
  in rudimentary uterus, 23
Vicarious menstruation, 795-797
  hematosalpinx attributed to, 312
Vichy, springs of, for vesical calculi, 277
Vidal, 370, 372
Villous, growth of the bladder, 552
Vineberg, 383
Vinegar, in treatment of carcinoma of the breast, 608
  irrigations with, in carcinoma of the rectum, 597
  use of, to arrest hemorrhage in inversion of the uterus, 752
Virchow, 354, 500, 614, 616, 635
Vitræ, 391, 409
Volbrecht procedure for hydrocele of the round ligament, 685
Volsella, 822
  Newman reverse-acting, self-locking, 847
Vomiting, in ovarian tumor with twisted pedicle, 642
  postoperative, 871, 872
Vulva, absence and atresia of, diagnosis of, 2
    procedure for, 2
  adenoma of, 626
  anatomical considerations of, 1
  aphthæ of, 434
  atresia of, pseudohermaphroditism and, 4
  atrophy of, 701
    progressive cutaneous, 702-704
      symptoms and diagnosis of, 704, 705

Waldeyer, 636, 677
Waldstein, 614
Wallace, J. R., 797
Walther, 393, 411, 425
Walton procedure for atresia of vagina, 19
"Wandering" erysipelas, 367
Warren procedure for plastic resection of the breast, 663, 664
Wassermann-Noguchi reactions, 357, 358
Water, in treatment of mixed infection of the kidney, 477
  in treatment of renal calculi, 288
  in treatment of vesical calculi, 277
Waterhouse, 708
Watkins, 708
Wechselbaum, 687
Weigert, 403
Weir, 702
Weisswange, 319
Welch, 444, 445
Wells, Sir Spencer, 640, 641, 652
Werder, 215
Wernitz, 611
Werth, 412, 637
Wertheim, 438, 453
Wertheim procedure of abdominal panhysterectomy for carcinoma of the uterus, 576-582
Wertheim's medium, 322
Westermeyer-Jäcksh, 400
Whitacre, 387, 390, 392, 394, 401, 403, 426, 715
Whitacre's table for differentiation of carcinomata and epitheliomata, 410
White's method of reducing an inverted uterus, 754
Whitehead procedure for excision of hemorrhoidal zone, 700
Wiatt's (Pierre) case of misplaced Fallopian tube, 31
Widal, 365
Wiener, 489
Wilhelm, 678
Wilkes, 685
Wilkinson's ointment, for intertrigo of the vulva, 448, 449
  in treatment of eczema marginatum, 484
Williams, Roger, 535, 538, 547, 610, 615
Williams, Whitridge, 27, 68, 292, 393, 402, 535, 636, 730, 735, 785
Williams (Whitridge) procedure for induction of abortion by dilatation and curettage, 711
Williams' "unsuspected tubal tuberculosis," 396, 398
Wilms, 638
Wilson, 620
Wilson's ointment, for intertrigo of the vulva, 448
  in erythema of the vulva, 450
  in folliculitis of the vulva, 454
  in herpes progenitalis, 456
Winckel, 399, 539, 611, 692
Winckel's case of double Fallopian tube, 29
Wing, 754
Winter, 302, 462, 542
  on normal bacteriology of the Fallopian tubes, 294
  on normal bacteriology of the vagina, 292
Wire, resection of kidney by use of, 166, 167
Withrow, 715, 780
Witte, 436, 438, 439, 440, 441, 442
Witte's examination of Fallopian tubes for bacteria, 294
Wladimiroff, 760
Wolff, 399, 400, 401
Wolffian bodies, origin of vaginal cysts in, 667
Wounds. *See* Trauma
  penetrating, of the uterus, 133, 134
Wright, Sir Almroth, 422
Wulff, Madame, 735
Wylie, 501

X-ray, in diagnosis of foreign bodies in the uterus, 274
    of mixed infection of the kidney, 476
    of renal calculi, 287
    of ureteral calculi, 279, 281
    of vesical calculi, 277
  in treatment of carcinoma of the urethra, 582
    of carcinoma of the vulva, 561

Yamigiva, 645
Young, H. H., 319
Young's (D. S.) case of ovarian myoma, 499

Zahn, 394
Zemann, 490
Zetter, 641
Ziegler, 500, 550, 671
Zinc chlorid, use of, in palliative treatment of uterine carcinomata, 565, 566
Zinke, 500, 504, 678, 679, 680, 682, 691, 692, 693
Zinke's modification of the Simon-Hegar procedure for lacerated perineum, 82
Zweifel, 309, 438, 439, 735

(1)

N201 Reed, C.A.L. Diseases
R323. of women.
1913 30072

NAME	DATE DUE
A. J. Hood	MAY 14 1920
J. Van Brower	FEB 22 1935

30072